The Tool Engineer

IH: DOLLARS FROM MANUFACTURING RESEARCH . . . Page 67

LICATION OF THE AMERICAN SOCIETY OF TOOL ENGINEERS

APRIL 1952

VOLUME XVII, NO. 4

PLANNING ENGINEERING CONTROL OF TOOLING EQUIPMENT PRODUCTION

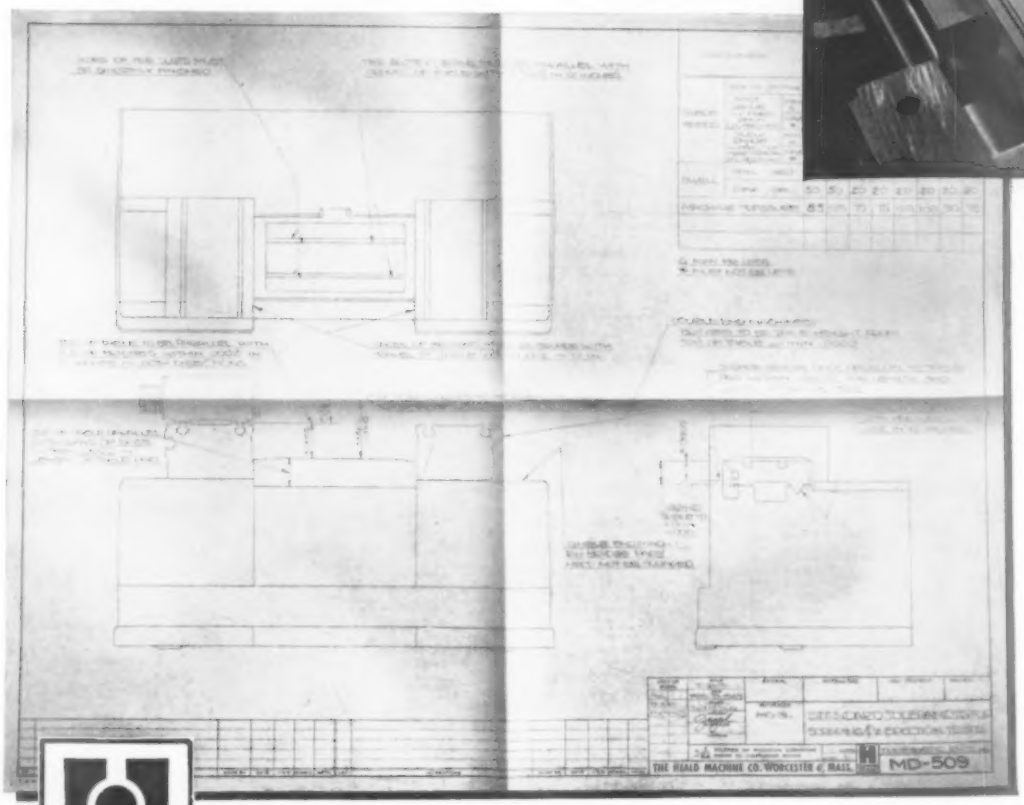
the last .0002 inch is the hardest

...yet no pains are spared to put this extra precision into every Heald machine —so YOU can get more precision out of it

The *best* way isn't always the *easiest*. That's particularly true of the parallelism between the flat and vee table ways and the table pad on a Heald machine. To meet the extremely close manufacturing tolerances that are *standard* for every machine, these table ways are carefully hand scraped by skilled craftsmen. For there is no compromise with *quality* when it comes to building Heald Bore-Matics and Grinding Machines.

True — it means a lot of careful work, and it takes a little extra time. But the results are worth every bit of it TO YOU — in terms of faster, better production, longer machine life, with higher precision and greater accuracy.

Hand scraping puts the ing touches on the flat table ways of a Heald Matic.



This blueprint shows the facturing tolerances standard for all Heald Matics.

HEALD

Heald machines speed the nations production

THE **HEALD** MACHINE COMPAN

WORCESTER 6, MASSACHUSETTS

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ME XXVIII
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, 1952

The Tool Engineer

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AMERICAN SOCIETY OF TOOL ENGINEERS

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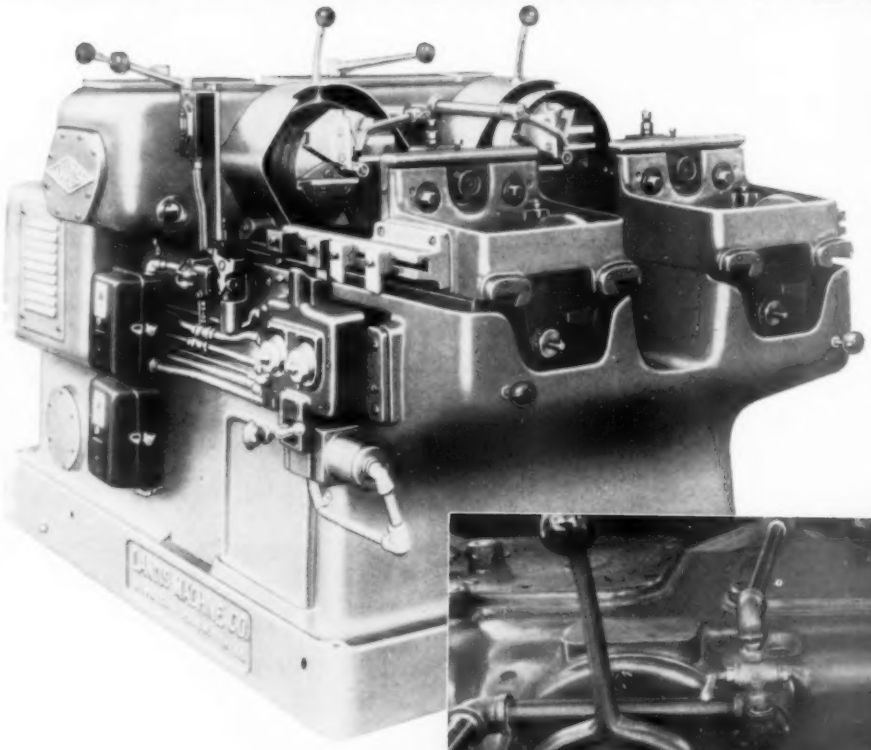
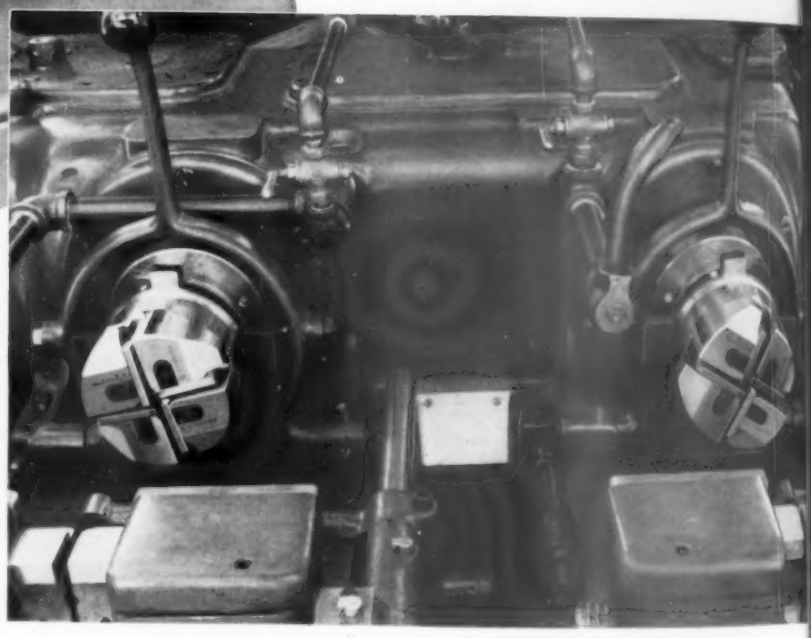
OFFICE OF PUBLICATION: 239 E. Chicago St., Milwaukee, Wis.
EXECUTIVE AND EDITORIAL OFFICES: 10700 Puritan Ave., Detroit 21, Michigan.

HOLLOW MILLING

Extra LANDIS Feature...



LANDIS Die Heads, in addition to conventional threading operations, can be equipped with LANDIS Turning Cutters which will perform turning, grooving, forming, and facing by the hollow milling method. Milling operations may be performed by LANDIS Heads applied to automatic screw machines, turret lathes, or LANDIS leadscrew-type or hydraulic-feed threading machines, and other positive-feed-type machines.



Many Production Advantages

Hollow milling by this method offers an increased efficiency occasioned by the application of a multiple number of cutting tools. The feed rate is thus approximately equal to that of a single tool, multiplied by the number of simultaneously-functioning cutters in the unit—four or six for LANDIS Heads.

The LANDMACO Double Head Leadscrew Threading Machine affords a particularly efficient hollow milling method. One carriage will perform the milling operation while the other carriage is being loaded by the operator, thus allowing consistent continuous production. In addition it is entirely practical to perform milling operations on one spindle and conventional threading operations on the other.

LANDIS Turning Cutters

LANDIS Cutters are economical tools for they are usable for most of their original length. Only the rake angle needs regrinding—a quick and simple procedure. One set of cutters will machine a wide diametrical range of work, and cutting speeds will range from 30 to 70 linear feet per minute.

Wear and breakage of tools and spoiled work is held to a minimum. The cutting edges of the cutters can be precisely and uniformly located with relation to the center line of the work since they are diametrically-opposed in the cutting position. Thus with cutting strains evenly distributed, the work-piece is never forced out of alignment.

Additional information will be supplied on request—please include specifications.

LANDIS *Machine* COMPANY · WAYNESBORO PENNSYLVANIA

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ELMIRA, N.Y.

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Collet Chucks with HARDINGE STEEL COLLETS

Available in Five Sizes:
1", 1⅜", 1¾", 2¼", and 3½" collet capacity.

for Accuracy and Durability at Low Cost

When you order Hardinge-Sjogren Chucks and Hardinge **Steel** Collets you get all these advantages:

1. Complete Capacity for Hexagon and Square as well as Round.
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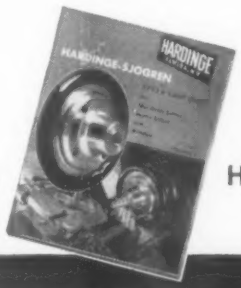
. . . . . and HARDINGE tempered steel collets assure you of quick release, sustained accuracy and durability.

Write for Bulletin 8— complete information on

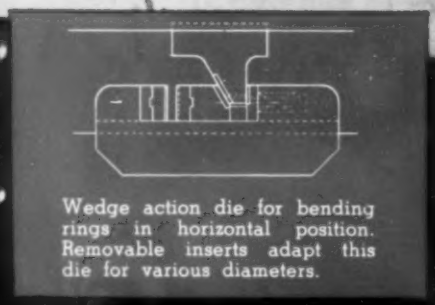


HARDINGE-SJOGREN Chucks and Collets.

HARDINGE BROTHERS, INC., ELMIRA, N. Y.

"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"

GIANT GEAR RIMS



Wedge action die for bending rings in horizontal position. Removable inserts adapt this die for various diameters.

Just another job for versatile CINCINNATI PRESS BRAKES

This 35½" diameter, 4" face steel gear is economically produced by bending and welding.

This steel gear rim is completely formed from flat bar to ring in less than two minutes by repeated hits on a Cincinnati Press Brake.

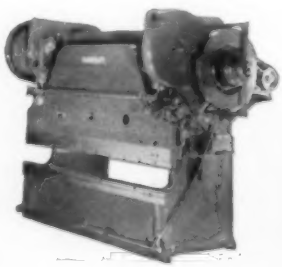
The wedge action dies require but little tonnage to bend this 2" x 4" hot rolled 35-45 carbon steel bar.

The great versatility of the Cincinnati Press Brake eliminates the need for an additional and highly specialized machine on this small-run job.

Low cost and quick changeover from job to job are among the factors that will make Cincinnati Press Brakes profitable in your shop.

Write for Press Brake Catalog B-3.

Contact our Engineering Department, who will suggest and advise on your production problems.



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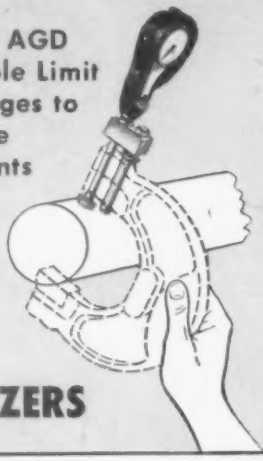
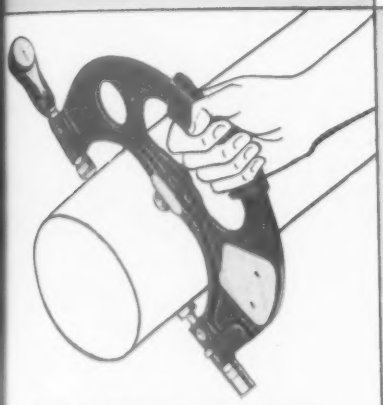
Converts AGD Adjustable Limit Snap Gages to Dial Type Instruments

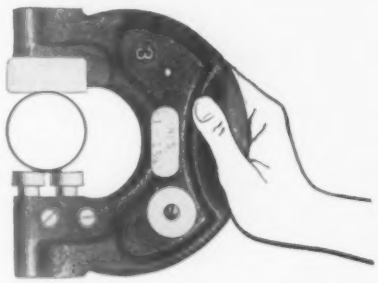


DIALIZERS



DIAL SNAP GAGES

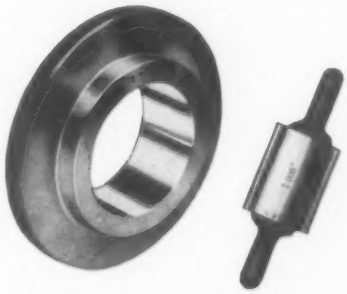
DIAL COMPARATORS



ADJUSTABLE LIMIT SNAP GAGES

Light in Weight
Sensitive, Definite Check

DUBO PLUG GAGES



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STANDARD GAGE CO., Inc., Poughkeepsie, N.Y.

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WINTER offers two series of taps: general purpose, and taps for special applications. Both are standard items, stocked at factory branches and by most dealers.

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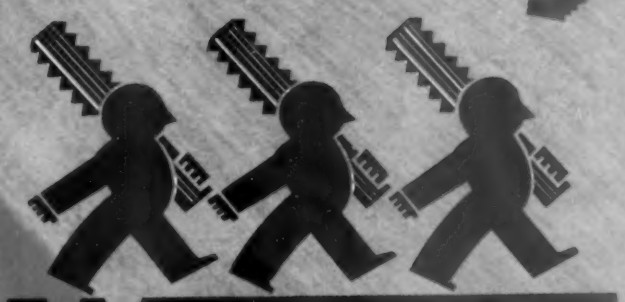

WINTER

Standardize ON NATIONAL END MILLS

r smooth, efficient operation at high speeds and feeds ou will do well to *standardize* on NATIONAL Metal Cut- ng Tools.

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. . . for all your staple industrial needs, including NATIONAL Twist Drills, Reamers, Counterbores, Milling Cutters, End Mills, Hobs, and Special Tools.

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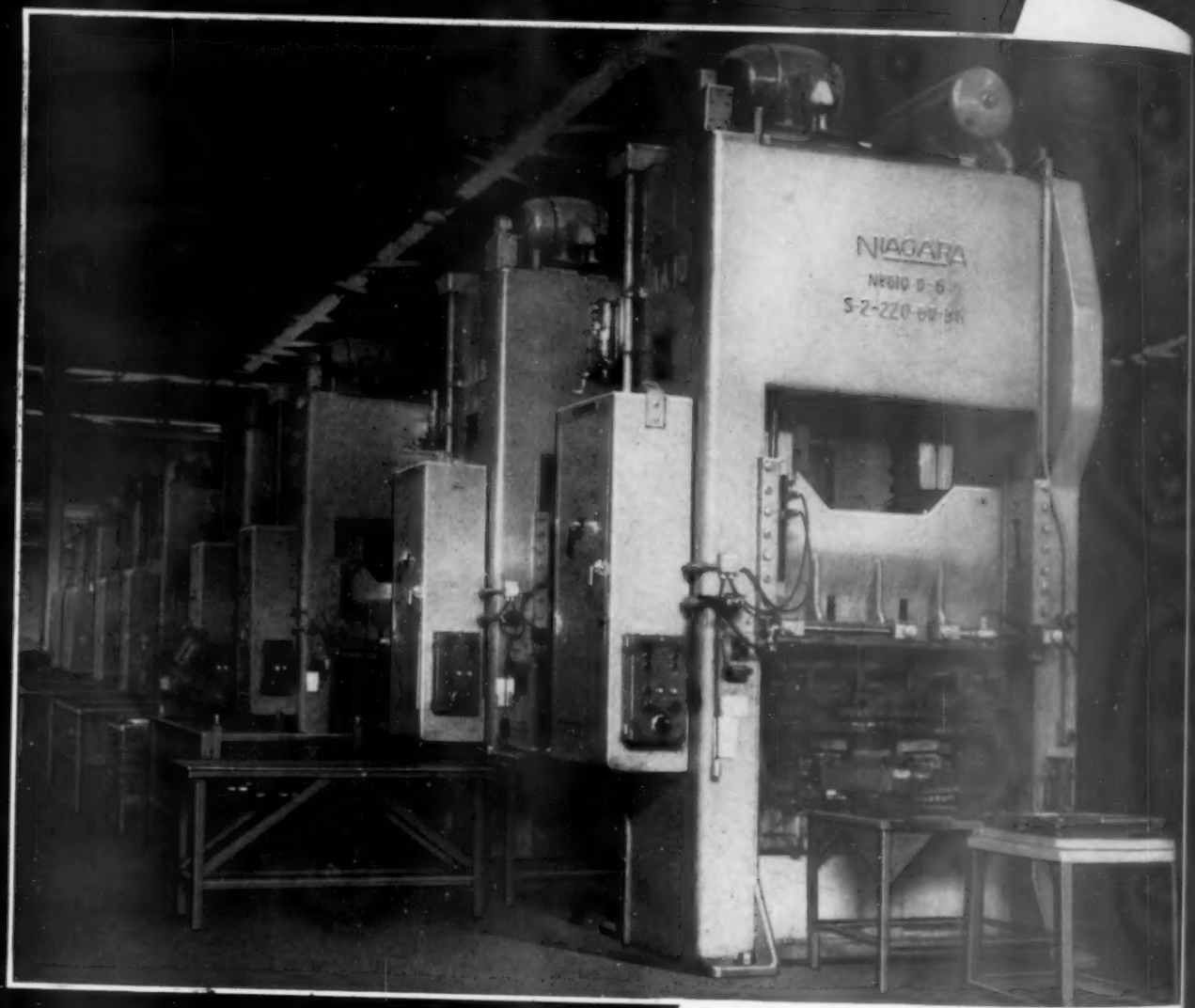

Typical production line of
Niagara Straight Side Double
Crank Presses in one of America's
foremost automotive plants

NIAGARA MACHINE & TOOL WORKS • BUFFALO 11, N.

straight side double crank PRESSES

Speeding up Defense Production in Large Automotive Plants

Niagara advanced engineering features and modern streamline styling combine to make these presses leaders in their field.

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- Neither gearing nor shafting overhang the working area to block light and be a potential danger
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- Single or double end (twin) drive
- Adjustable air counterbalance for slide
- Pneumatic draw cushions with adjustable pressure and surge tank
- Wide range of sizes and capacities
- J. I. C. features if desired

Write for catalog

Manufacturers of a complete line of sheet metal working equipment ranging from small hand tools up to large power operated machinery.

DISTRICT OFFICES: DETROIT • CLEVELAND • NEW YORK

"There's NO END to the types of END MILLS made by MORSE!"

You name 'em . . . Morse makes 'em!

From left to right: short and stubby where the smallest, standard mill is required; double-ended if you prefer; with a *left*-hand spiral but *right*-hand cut to throw chips ahead; ball end for die cavities, fillets and round-bottomed, holes or slots.

Morse also makes 'em with two flutes, single or double end, cleared so as to cut to center, permitting plunge cutting; in taper shank styles for use direct in machine spindles; and the shell design, the old standby for face or slab milling cuts.

And there's a wide range of lengths in the exclusive, Morse Hi-Helix, shear-cutting design.

You name the job — Morse makes the End Mills . . . *no end of them!*

Morse Twist Drill & Machine Company
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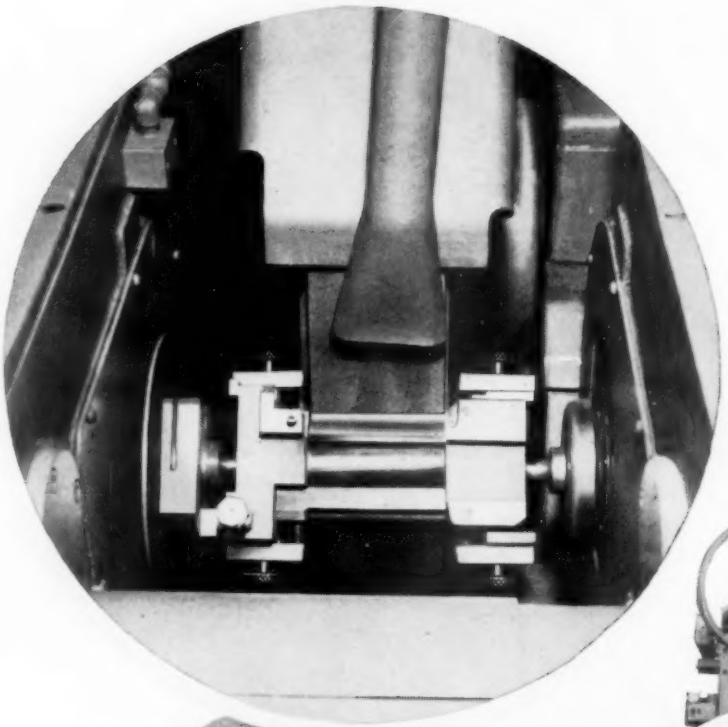
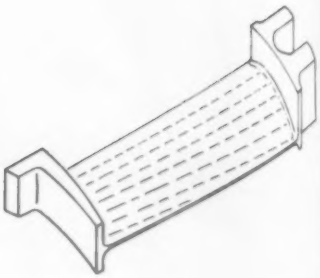
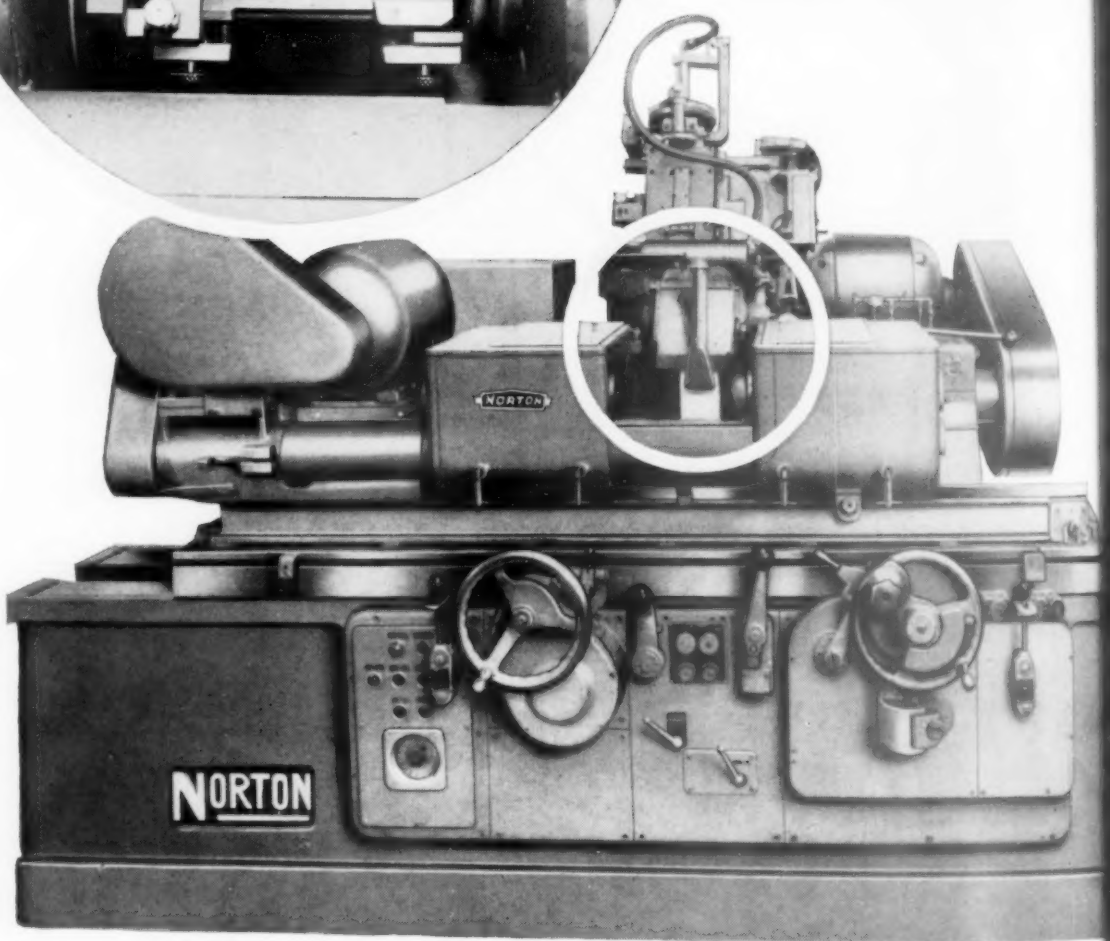
Warehouses in New York, Chicago, Detroit, Houston, San Francisco

MORSE
Cutting Tools

One-plunge Grind for the External Airfoil Surface of Turbojet Buckets or Blades ..... on the







Making better products to make other products better

NORTON COMPANY, WORCESTER 6, MASS., U. S. A.

DISTRICT SALES OFFICES: HARTFORD • NEW YORK • CLEVELAND • CHICAGO • DETROIT

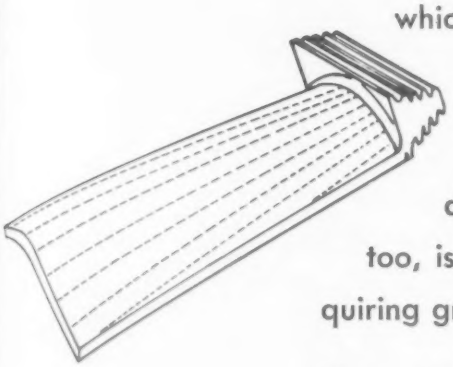
NORTON Compound Contour Jet Blade Grinder

[Patent Applied for]

The complicated engineering problem of grinding jet engine buckets and blades having twisted contour but with straight line fairing has been solved.

The NORTON Compound Contour Jet Blade Grinder plunge grinds blades semiautomatically with a positive control of contour and finish of the external airfoil surface.

An ingenious arrangement of cams in dual shape-producing units provides the precisely correct motion for the workpiece which presents the surfaces to be ground at the horizontal centerline of a wide grinding wheel.



This set-up permits efficient grinding, high production and consistently high quality. Important, too, is the fact that all this is accomplished without requiring great effort or skill on the part of the operator.

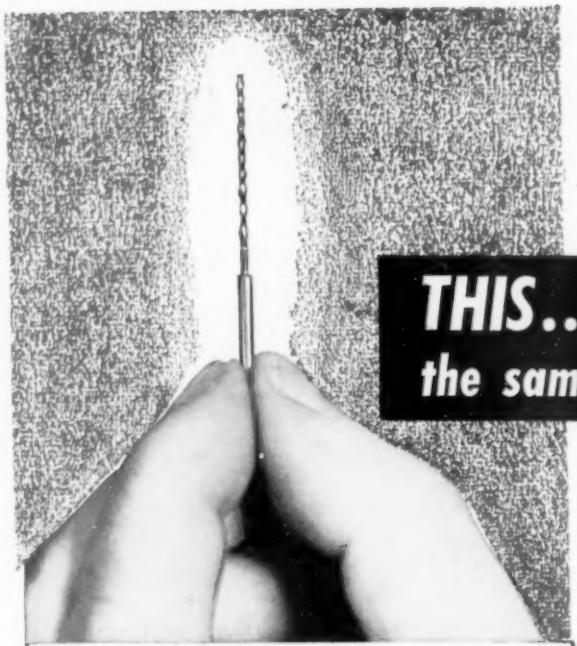
This unique, new NORTON design includes many important engineering features and principles proved in the NORTON Type CTU line of cylindrical grinding machines.

If you, too, have the problem of obtaining high production and consistent accuracy combined with ease of operation in grinding complicated shapes, our engineers will be glad to provide specific recommendations—at no obligation to you.

To Economize Modernize with NEW

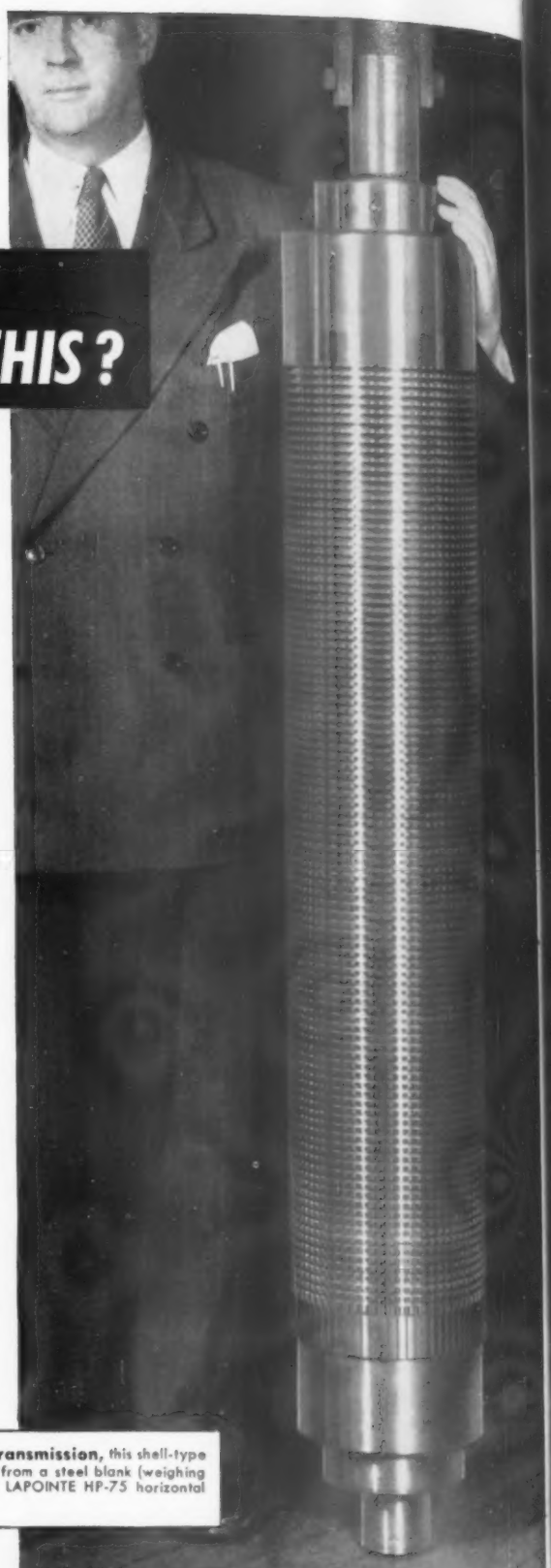
NORTON

GRINDERS and LAPPERS



THIS... the same as THIS?

To clean up the gas nozzle in the carburetor of one of the world's most popular makes of automobiles, this "mighty midget" of a broach is only .042" in diameter . . . has 3 cutting teeth, 4 burnishing teeth.



Of course there's a dramatic difference in size and purpose, but basically they're *just alike* . . . both are LAPOINTE *quality broaches!*

LAPOINTE makes a full range of sizes and types of broaches, but there's *only one quality;*

LAPOINTE makes a full range of broaching machines — more than 50 standard models — but there's *only one ideal:* perfection . . .

LAPOINTE makes a full range of fixtures, but there's *only one objective:* simple, fast, safe operation!

LAPOINTE — the world's oldest and largest manufacturer of broaching machines and broaches — can take full responsibility for your complete broaching needs: and there's *only one LAPOINTE!*

BROACHING GIVES YOU the maximum in production speed, together with unequalled repetitive accuracy to close tolerances.

To broach clutch plates for tank transmission, this shell-type broach has 69 splines . . . was formed from a steel blank (weighing nearly half a ton) and is used on a LAPOINTE HP-75 horizontal Broaching Machine, 37½ Ton.

Specifications of all LAPOINTE vertical pull-up Broaching Machines are given in our Bulletin VPU-5. Write for it.

THE *Lapointe* MACHINE TOOL COMPANY

HUDSON, MASSACHUSETTS • U. S. A.

Branch Factory: Watford, Herts., England

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHES AND BROACHING MACHINES

5 METALS IN PRECISION-MADE REEL MACHINED WITH ONE SUNICUT OIL

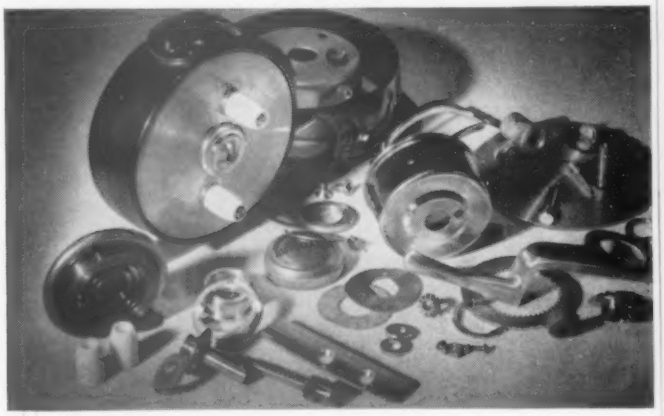
The Ocean City Manufacturing Company operates Brown & Sharpe automatics on free-turning brass, aluminum, cold-rolled steel, phosphor and hardware bronze. Having used Sunicut Cutting Oils since 1941 with complete satisfaction, the plant decided a year ago to find out what other products could do. Numerous competitive oils were tested, and the best was selected for a long trial run.

But this oil did not prove satisfactory in actual use. It caused the gibs to corrode and the slides to stick. Operators found miking difficult. Downtime and rejects grew to disturbing proportions. Finally, to protect its automatics and restore its production efficiency, the plant decided to go back to Sunicut Cutting Oils and standardized on Sunicut 11.

Sunicut 11 is a "Job Proved," dual-purpose cutting oil for automatic screw machines. Its transparency permits quick and accurate miking. Among its virtues is the fact it will not stain brass. It drains rapidly, minimizing carry-off. And its high lubricating and cooling properties aid in prolonging tool life and improving finishes. Moreover, it protects finished parts from rust and corrosion. For other outstanding cutting oil case histories write for booklet TE-4.

NE: Brown & Sharpe No. 2G • **METAL:** 11 ST aluminum
TIONS: Feed stock, center drill, counterbore, recess and coun-
tap, form and cut off • **SFPM:** 800 • **SPEED:** 3,150 rpm
CTION: 250 collar housings per hr. • **CUTTING OIL:** Sunicut 11

HINING PARTS for Ocean City's "90" Automatic Reel. t 11 does not corrode the bronze gibs of the automatics, izes carry-off, makes miking easy. A coolant tried as onomical" replacement failed on all three counts.



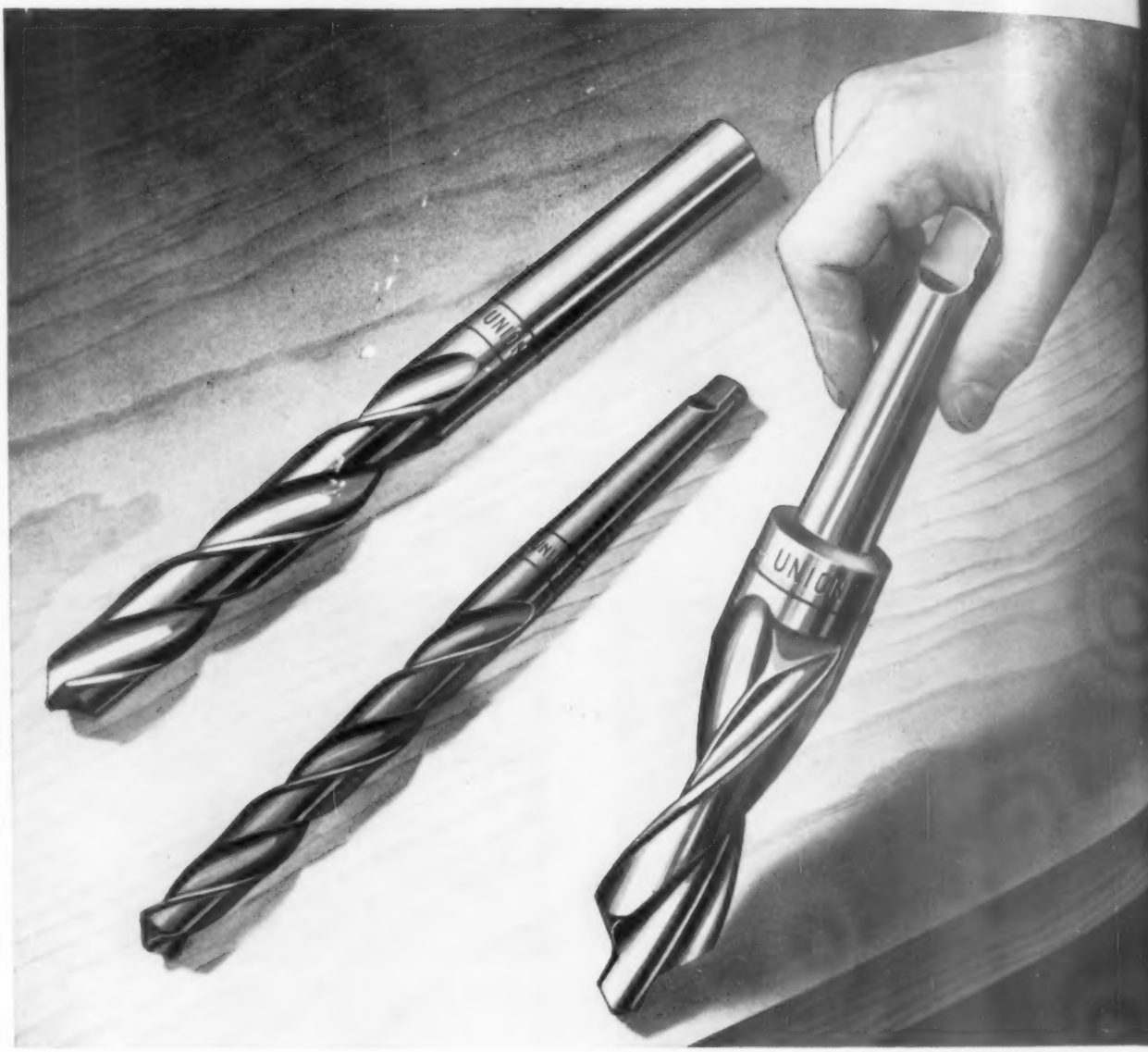
THIS AUTOMATIC REEL contains six types of metals . . . free-turning brass, aluminum, cold-rolled and stainless steel, phosphor and hardware bronze. Another Sunicut grade is used on the stainless steel.

THE PRECISION PARTS that Sunicut 11 helps to make possible are put to the test as this top-quality reel goes into action. Little does the fisherman know how much of his pleasure he owes to a cutting oil.

SUN INDUSTRIAL PRODUCTS

SUN OIL COMPANY, PHILADELPHIA 3, PA. • SUN OIL COMPANY, LTD., TORONTO AND MONTREAL

SUNOCO



WHICHEVER TYPE YOU CHOOSE, you're sure of accurate, fast-cutting, long-lasting performance when you choose Union Twist Drills.

Union Straight Shank Drills come in carbon steel (No. 110) and high speed steel (No. 510) in 89 diameters from ⅛" to 2". *Union Heavy Duty Taper Shank Drills* come in high speed steel (No. 370) in 81 diameters from ¼" to 1½".

Union Sub-Land Drills are specials made of high speed steel and are designed for drilling holes of two or more diameters in one operation.

The margin of each step is continued the full length of the flute so that these drills, by repeated sharpening, can be used the entire length of the fluted section.

no other twist drill will outperform a **UNION**

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UNION TWIST DRILL COMPANY, ATHOL, MASSACHUSETTS

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roduction Pointers from GISHOLT

GISHOLT

TIME-SAVING IDEAS

Presented as a service to machine shops, we hope some of these interesting ideas, culled from thousands of jobs, will suggest ways to help you cut time and costs in your own metal work.

CROWDING 22 CUTS IN 2.5 MINUTES

vo Simplimatics Team Up for Rapid Production

re's a rather intricate bevel drive r blank that calls for 22 cutting ls to machine it. Normally, sev- l operations would be needed to the job.

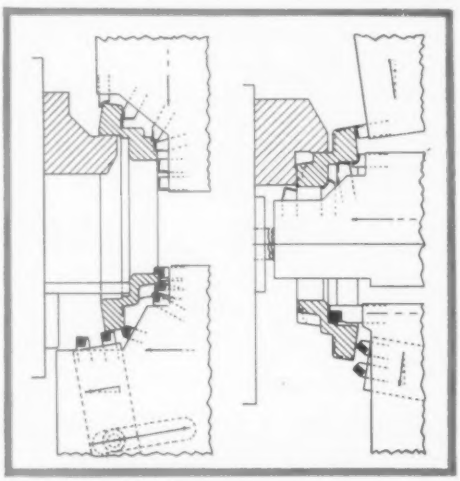
Not this time. The job has been *mpled*" down by the Simplimatic tomatic Lathe—with two ma- nes handling all 22 machining erations. It's possible because the ge platen table of this machine rmits a flexibility of slide arrange- nts to bring more tools into work. One operator tends both ma- ines, with the 22 cutting oper- ations split between the two so that a completed blank is turned out every 2.5 minutes.

A Machine for Each Side

The first Simplimatic has a total of 14 tools arranged in the front and rear slides which do all exterior surfaces and the hub face. The part then moves to the second machine which has a total of 8 tools on three slides. The center slide handles the bore. The front slide roughs the taper face with a matched cut, while the rear slide finishes.

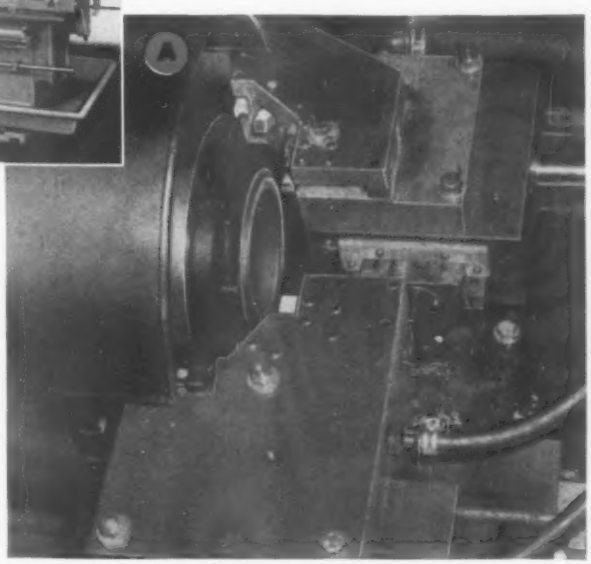
The almost limitless slide possibilities and large number of tool approaches of the Simplimatic allow this standard machine to do the job with all the benefits of a special machine.

The Simplimatic catalog pictures a wide range of interesting jobs. Ask for your copy.

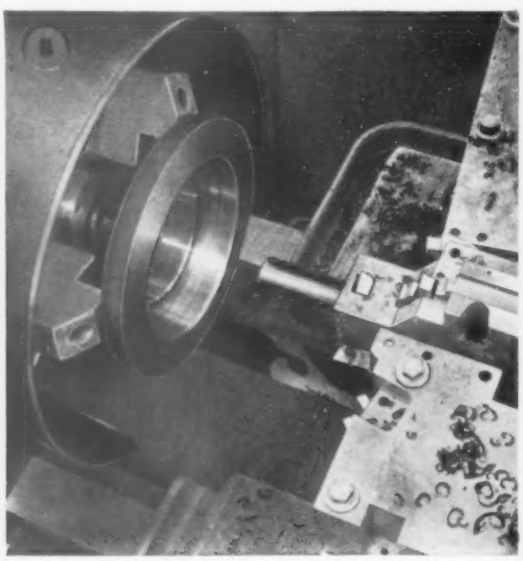


Tool setups for both Simplimatics.

plimatic Automatic Lathe.



First operation in ma- ining the bevel drive gear anks has 14 tools working front and rear slides.



For the second oper- ion, this Simplimatic has a nter slide in addition to ont and rear slides. Eight ols are used this time.

GISHOLT

TIME-SAVING IDEAS

HOW TO MAKE EASY WORK OF DEEP GROOVIN

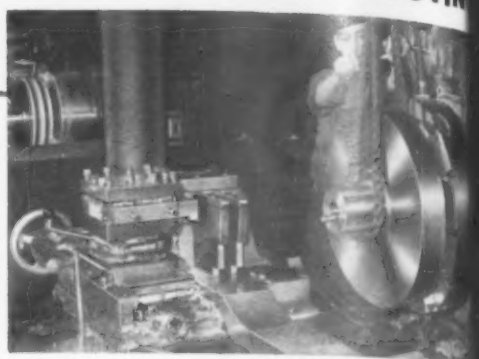
Special Attachment enables Standard Turret Lathe to do job

The large, heavy workpiece you see being handled here is a torsional vibration dampener for a diesel engine. The tricky part of the machining job is the cutting of two grooves around the 21" periphery—each 1 3/16" wide and 7 1/4" deep.

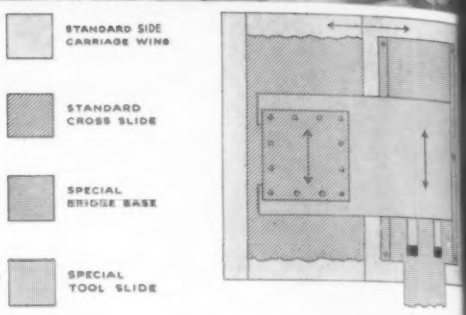
The work is divided into roughing and finishing operations on two 4L Saddle Type Turret Lathes, each having a special attachment on the standard cross slide carriage. This consists of a special bridge base bolted to the carriage wing at the front. This bridge also bears on the rear way and is held down and gibbed. On top of this fixed base is a tool slide block with extensions that clamp into the square turret. Thus, the forward motion of the cross slide and square turret carries the tool block and slide into the work.

The job starts with the first machine plunge cutting the two grooves to 1 1/8" width and full depth. Cuts are started at 17 r.p.m. and progressively increased to 31 r.p.m., with .006" feed used throughout. H.S.S. milling cutter blades, with a radius formed to curl the chips, are mounted in 1095 steel shanks.

The part is then moved to the second machine where the grooves are increased to 1 3/16" width with the feed increased to .012". Finished width is held to .005", and the faces are held to .001" of perpendicular.



Loading the 250 lb. steel forging for first operations in cutting two 1 1/8" grooves to 7 1/4" deep. In background, second machine increases grooves to 1 3/16".



Schematic sketch of the special attachment on the standard cross slide carriage.

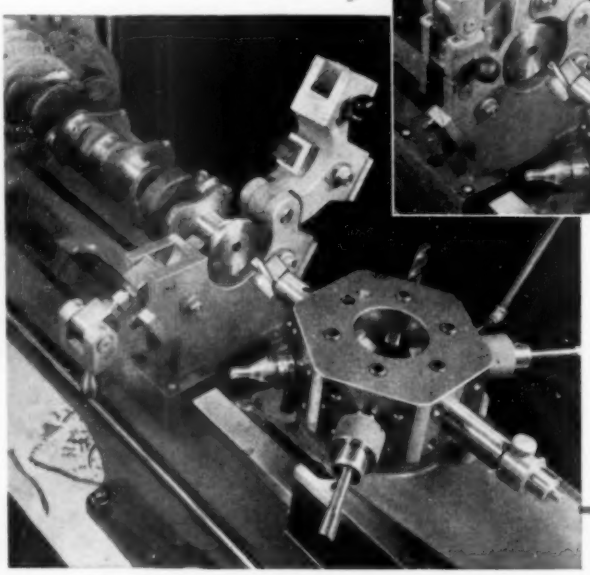
The weight, size and material of the part—250 lbs. in 21 inches of steel forging—are good reasons for using the sturdy, powerful Gisholt 4L Turret Lathes on this job.

On this simple adaptation of Standard Turret Lathes, heavy workpieces are deep grooved with ease and accuracy.

LONG BED TURRET LATHE FINISHES CRANKSHAFT END

The opened steadyrest for locking crankshaft. All work is done on this end by the six turret stations.

Closed steadyrest.

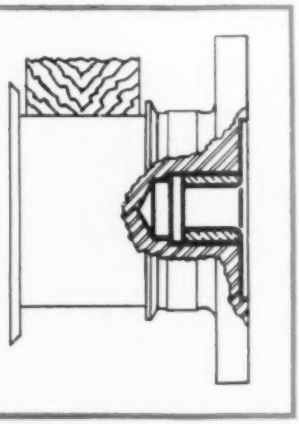


All Work Handled from Hexagon Turret

This standard No. 3 Ram Type Turret Lathe has a special job—machining the flange end of a six-cylinder automobile crankshaft. To suit it for this singular job, there is a 24" longer bed and the front carriage has been omitted.

The crankshaft is driven from the gear end. The driving fixture (which has been balanced on a Gisholt Balancer) is a hinged half-bearing which drives against the crank cheek. The other end of the crankshaft has the main bearing supported by a steadyrest equipped with end-grain hardwood shoes.

Machining operations are relatively simple—drill, counterbore, finish bore and ream. After these, a .000" undersize bushing is placed on the turret arbor and pressed into the counterbore. This permits the bushing to be reamed from the final turret station. Floor-to-floor time is 3 minutes. It's a good example of how a Standard Turret Lathe can be inexpensively adapted to handle an unusual part with speed and precision.



Cutaway drawing shows work on crankshaft end.

Simple bed extension enables this standard Ram Type Machine to perform 6 special finishing operations on crankshaft ends with all work handled from hexagon turret.

GISHOLT

GISHOLT

TIME-SAVING IDEAS

ONE MACHINE OUT-PRODUCES TWO

No. 12 Hydraulic Cuts Time 70%

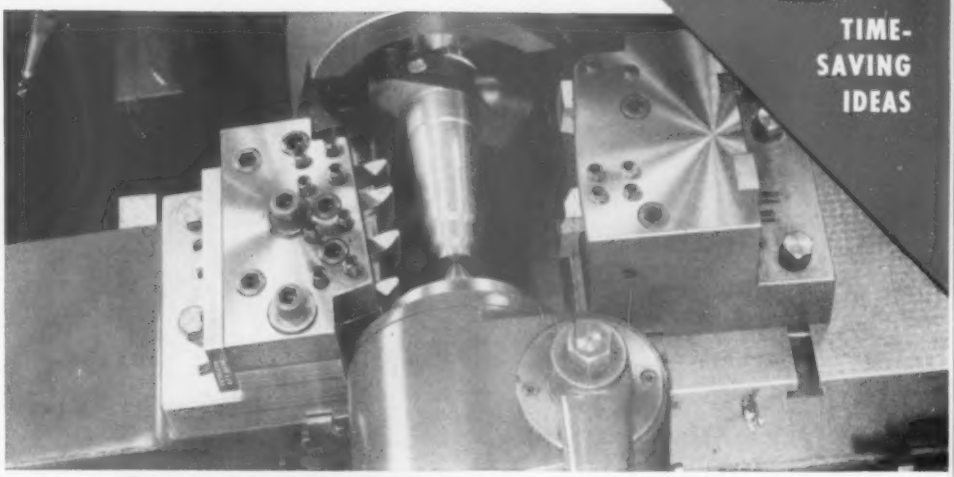
s a case where production of d steel diesel injector bodies led along at 12 per hour with athes on the job.

oking for a better way, this man- urer found it—and did away with ond machine to boot. Now, the handled on one No. 12 Hydrau- utomatic Lathe at the rate of a leted part every 1.5 minutes—er hour.

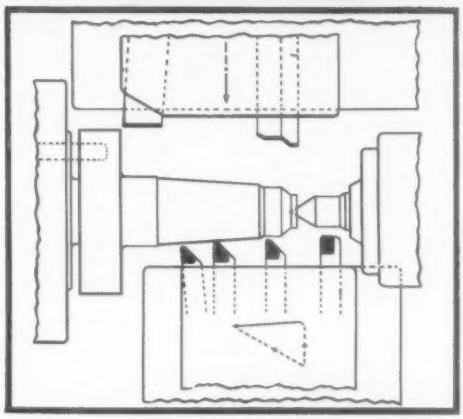
ur tools on the front carriage turn the entire length of the . Two tools on the rear slide in to face the shoulder and then into reduced feed to shave form traight diameters. Tooling is planned, permitting two other es of similar style to be handled a minimum of changeover.

cause of the No. 12 Hydraulic's matic cycle, the operator is able andle another machine as well ven more production.

single automatic operation, this one 12 Hydraulic finishes parts in 1.5 tes, which two machines needed 5 tes to do.



Closeup of No. 12 Hydraulic Automatic Lathe tooled for machining injector body.



Tooling setup of front and rear slides of No. 12 Hydraulic.

New literature, showing 28 widely different jobs being done by this versatile machine, is now ready.

HOW TO MAKE BIG SAVINGS ON GEAR BLANKS

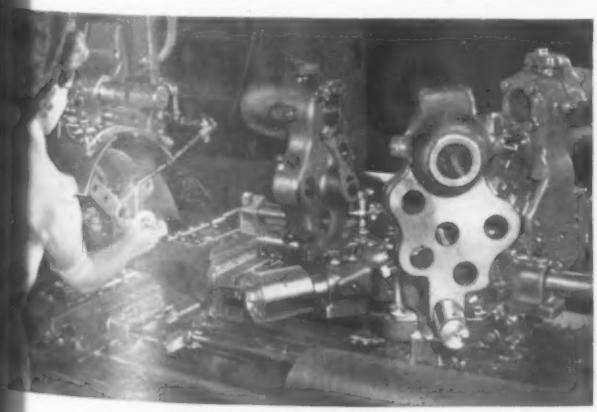
Four Times Faster Production on Fastermatic Automatic Turret Lathe

don't need long runs to profit n the economies of the Faster- ic Automatic Turret Lathe. Here's ase where the Fastermatic with ple, standard turret lathe tools duces gear blanks in lots of 100 h real savings.

The operations are rough and finish turning, facing and boring. Where it required 8 minutes to do the job by the older method, floor-to-floor time is now a flat 2 minutes —a 400% production boost! Moreover, because the entire cycle is automatic, the job was turned over to a woman—making skilled man power go further. Not only are critical tolerances maintained, because of the reduction of the human element of a hand-operated machine, but operator also runs a 2nd machine.

Write for copies of the Fastermatic Catalog and Fastermatic Tool Catalog, showing the many standard tools available for production work.

The Fastermatic with standard turret lathe tools, operated by a woman, proves the savings in time and skilled man power this machine makes possible —even in medium runs.



Fastermatic setup for machining 25 gear blanks per hour.

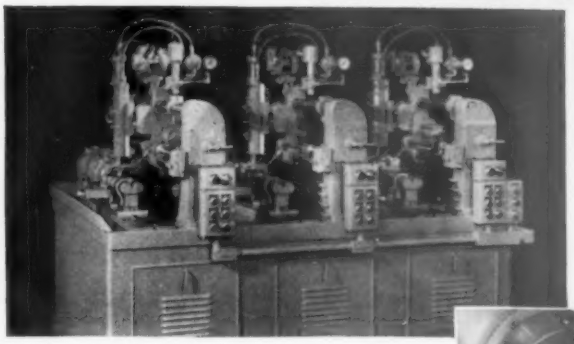
Rough casting and finished gear blank 2 minutes after.

GISHOLT

TIME-SAVING IDEAS

ONE MACHINE SUPERFINISHES THREE SHAFTS AT ONC

Three-Station Superfinisher Does Large Volume Job



Special 3-station Su... finisher for handling ... different parts at once.

Close-up of one statio... the Superfinisher. A... points to Superfinish ... which makes 4 passes ... stock rotated between ... two Phenolic rolls.

Here is the way shafts of various lengths and diameters are Superfinished at once on one machine. This Superfinisher, a special model, has three stations, each handling a different size. Station 1 handles ¼″ stock up to 9″ long; station 2 takes ½″ stock up to 16″ long, and station 3 accommodates ⅝″ stock up to 17″.

Stock is loaded into each station and buttons pressed to start operations. Phenolic rolls then rotate the work while the head with two Superfinish stones comes into working position. The oscillating head makes four passes over the stock at the rate of 7½″ per minute. After the fourth pass the head rises, an ejector raises the finished workpiece, and rolls it into a tote pan. The station then gets a new workpiece. All stations operate identically. Stock measures 15-20 micro inches RMS as it comes to the machine, and 3-4 micro inches RMS after Superfinishing.

One operator tends this 3-station Superfinisher to produce exceptionally smooth shafts.

Ask for book "Wear and Surface Finish," ... gives complete, up-to-the-minute informa...

HERE'S A REAL BALANCING DEPARTMENT

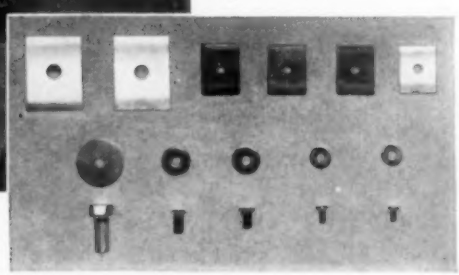
Wide Variety of Work Handled on Efficient Production Basis

The importance of balancing is given full recognition at the Buffalo Forge Company. This leading manufacturer of fan rotors uses balancing to eliminate vibration, premature bearing wear and undue noise in these rotating parts.

Theirs is a true *production* setup, with all balancing done in a complete, separate department as a regular part of manufacturing operations. A variety of Gisholt Balancing Machines do static and dynamic balancing of parts weighing from two pounds to two tons. Both balancing and correction of unbalance are done on t... same machines.

So fully systemized is this ope... ation, even unbalance corrections a... *pre-planned*. This is possible becau... the readings of unbalance can be ... to whatever unit of correction is mo... convenient. In this case, it's in gram... The operators take direct readin... from the balancers and then gath... studs or rivets and washers, ea... having a given weight, for the needed combination to make indicated co... rection on any workpiece.

These parts can be used in any combination to provide the exact weight in grams for correcting unbalance in all size rotors.



The complete, separate balancing department at Buffalo Forge Company.

Gisholt Balancing Machines great... simplify production balancing by e... abling the user to read the measur... ments in the exact correction un... most convenient for the work.

DYNETRIC BALANCERS

Production balancing like this is only one ... many helpful subjects offered in the complete ... program of the Gisholt Balancing School. ... Write for full details and starting date.

THE GISHOLT ROUND TABLE represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

452
No. 581

GISHOLT MACHINE COMPANY
Madison 10, Wisconsin

Write for your copy of Gisholt's new general catalog.

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

MODERNIZE YOUR TOOL GRINDER

THE NEW POPE SUPER PRECISION
1 HP, 3600 RPM MOTORIZED TOOL AND CUTTER GRINDER HEAD

With Angular Adjustment In A Vertical Plane

Specify this new and better motorized Spindle on your next tool and cutter grinder.

Replace less effective, less versatile heads on your present grinders.

This totally enclosed POPE Spindle with sealed-in lubrication has the radial and axial rigidity to make wheels cut faster — spark out quicker.

It produces the kind of cutting edge on your tools that stands up and cuts longer.

It is easy to install.

It reduces set-up time.

It reduces grinding time.

Ask us for a quotation

No. 82

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POPE MACHINERY CORPORATION

ESTABLISHED 1920

261 RIVER STREET • HAVERHILL, MASSACHUSETTS

BUILDERS OF PRECISION SPINDLES

witching to an abrasive BELT?

Grinding and polishing techniques have undergone major improvements in the past few years. One of many revolutionary developments is the "61" contact wheel, used with a coated belt on many operations previously performed with a bonded or a set-up wheel. In every case, the change has been made for just one reason —to yield a better result at a lower cost.

This is the kind of change that spells progress to every metalworking man who is battling against higher and higher costs. And this is the reason why you should welcome the CARBORUNDUM man or distributor salesman when he calls on you. There is nobody quite like him, for he's not in the position of having to back just one type of product, or two. He alone has the ability to help you specify the one RIGHT combination of abrasive product and abrasive method for every operation in your shop.

His counsel is experienced, practical, and above all completely free from bias—for he represents the only complete line of abrasives, from CARBORUNDUM, the world's best known brand name in abrasives. We suggest that you call him in today—it's to your profit!

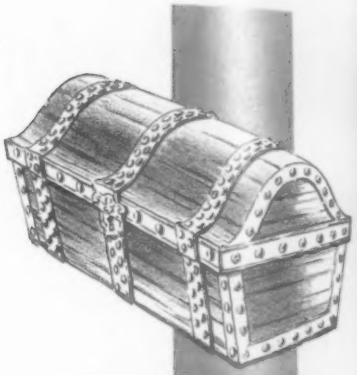
Here are only a few of the 30,000 reasons why you get the RIGHT combination of abrasive and method only from CARBORUNDUM

RUNDUM

MARK

offers ALL abrasive products...to give you the proper ONE

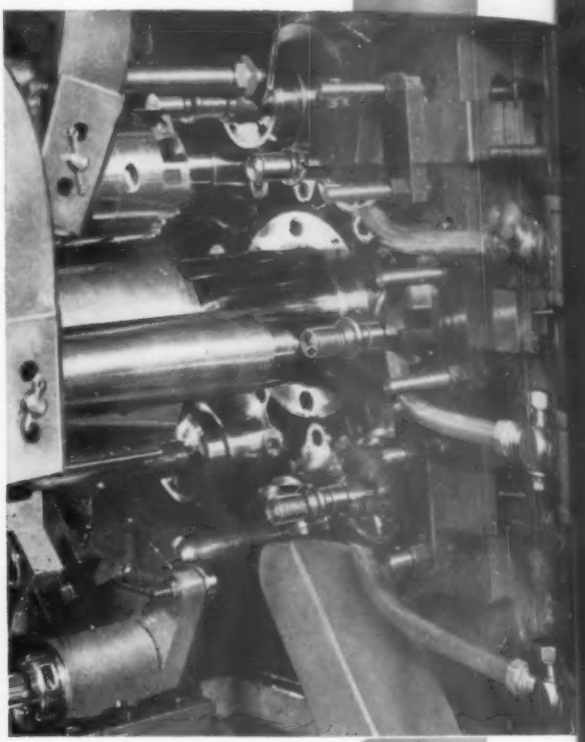
PIECES FROM EIGHTS



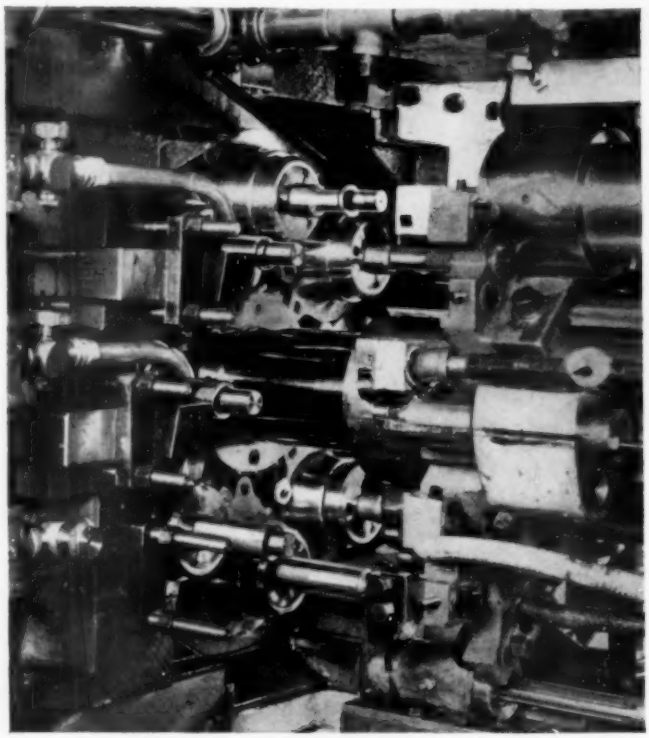
The first eight spindle bar automatics were introduced in 1930 by the late Frank L. Cone, founder of the Cone Company.

CONOMATIC Eights have had the usual opportunities available to any production tools that can handle added requirements and responsibilities.

With more tool positions than other "automatics", Eight Spindle CONOMATICS have an advantage in taking on, at one chucking, operations that save the costs of second handling.



Rear Side of Tooling Area

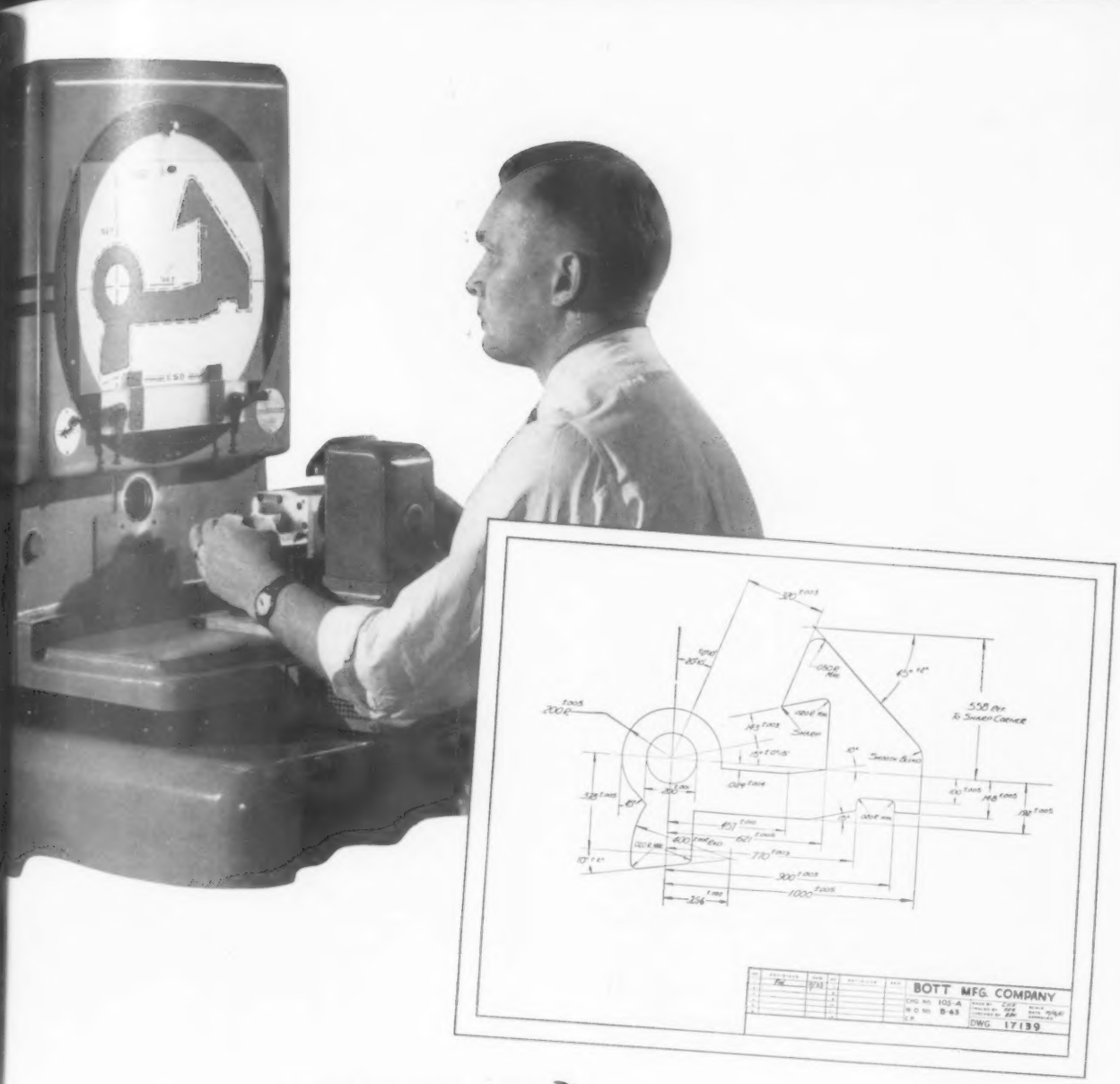


Front Side of Tooling Area

The milling and stamping operations performed by the 1⅝-EIGHT, on the piece shown, did not require stopping the spindle. The dependable performance of CONOMATICS makes such money-saving operations well worthwhile.

A Comparison of ALL Automatics is in favor of Cone

Conomatic } CONE AUTOMATIC MACHINE COMPANY, INC. WINDSOR, VT., U.S.A.



He checks 15 DIMENSIONS 8 RADII 7 ANGLES } in ONE operation

To check this part completely and accurately by usual methods, you might need as many as two dozen or more different gages—and you still wouldn't be sure all corners were sharp, all angles and radii exact. There's a much faster, more accurate way to do the job completely, one that requires no mechanical gages that can lose accuracy through wear.

On the Kodak Contour Projector, Model 3, you just slip the part into a holding fixture and compare its magnified image with a "chart-gage" over the bright screen. *Every* detail shown on the drawing is quickly and directly compared against the part itself, to close tolerances and in *one* operation. Little training or experience is required.

The part we show here is a relatively simple one for an optical comparator. With proper fixtures, charts, and accessories, you can measure all sorts of complex parts, large or small. Changes in specifications generally require nothing more than a corresponding change on the chart.

So overwhelmingly has industry turned to optical gaging that production of the Kodak Contour Projector, Model 3, the outstanding instrument for this method, has been greatly accelerated. Deliveries are rapid, and the cost of projector, fixture, chart-gages, and accessories usually comes below corresponding sets of mechanical gages. To get an idea of the large labor savings that the Kodak Contour Projector can bring to your inspection problems, get in touch with Eastman Kodak Company, Industrial Optical Sales Division, Rochester 4, N. Y.

the KODAK CONTOUR PROJECTOR

If you want to check precision spur and helical gears in action, write for information about Kodak Conju-Gage Instrumentation.

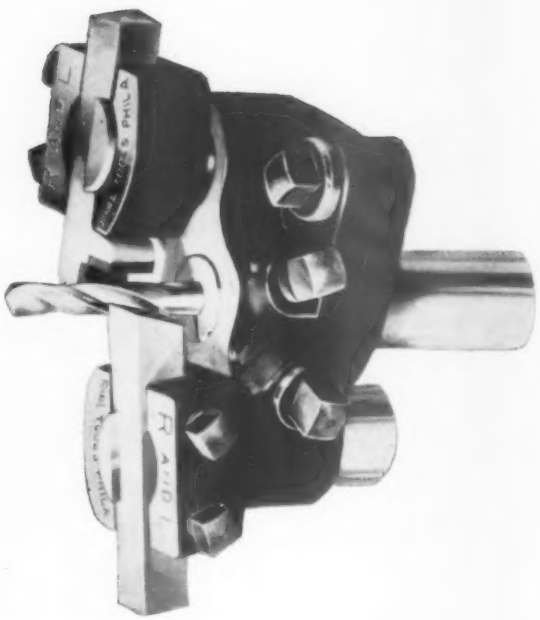
Kodak
TRADE-MARK

R AND L Tools

The use of the R and L Turning Tool will increase your production capacity and save on tool costs and tool inventory.

Here is a tool designed to work on right or left hand turning spindles and can also be used in place of fourteen single purpose tools at great savings in original cost and tool inventory.

It has become a favorite in many shops because of its easy set up and its ability to hold tolerances to .005.



Let us send you our 28 page catalog—which describes the R and L Tool line completely.

R AND L TOOLS

TURNING TOOL – TAP AND DIE HOLDER – UNIVERSAL TOOL POST – TURRET BACKREST HOLDER – CUT-OFF BLADE HOLDER – RECESSING TOOL
RELEASING ACORN DIE HOLDER – REVOLVING STOCK STOP – FLOATING DRILL HOLDER – KNURLING TOOL – CARBIDE AND ROLLER BACKRESTS

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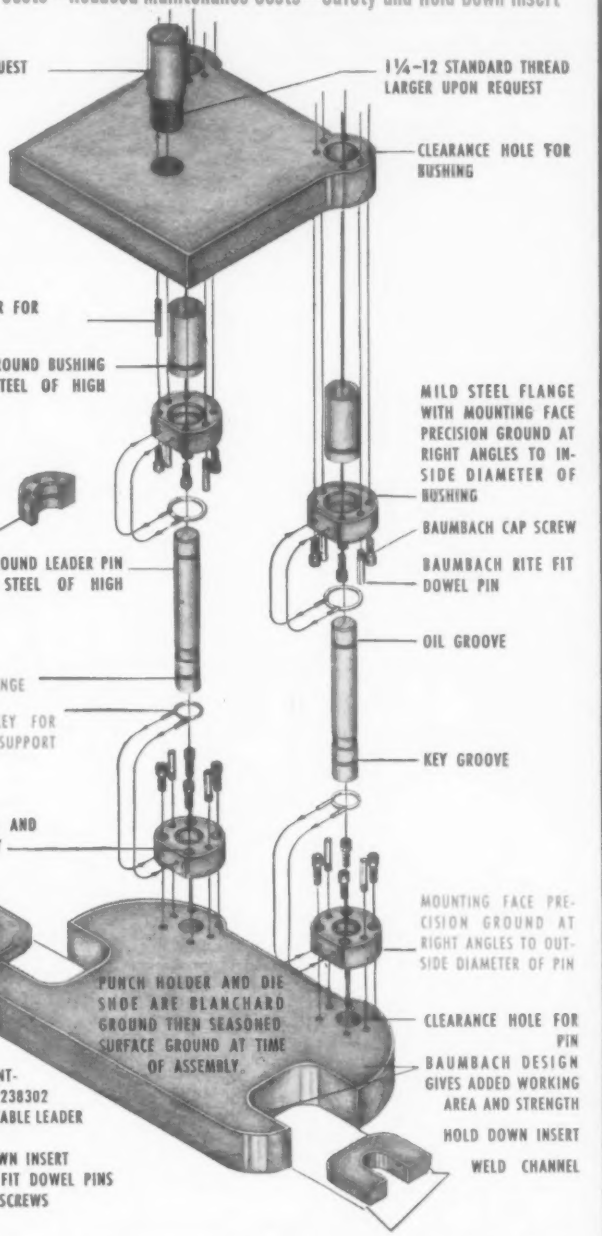
E. A. BAUMBACH MFG. CO.

1812 SO. KILBOURN, CHICAGO 23, ILL.

Advantages of Baumbach Demountable Pins and Bushings in Standard Precision Die Sets
Accuracy and Alignment
Flexability Reduced Die Costs—Reduced Maintenance Costs—Safety and Hold Down Insert



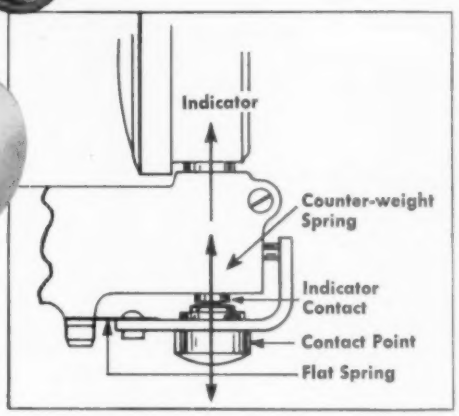
SET ASSEMBLY CONSISTS OF
1—SHANK AND KEY
1—PUNCH HOLDER
1—PAIR BAUMBACH DEMOUNTABLE BUSHINGS PAT. #2238302
1—PAIR BAUMBACH DEMOUNTABLE LEADER PINS PAT. #2238302
1—DIE SHOE AND HOLD DOWN INSERT
1—SET OF BAUMBACH RITE FIT DOWEL PINS
1—SET OF BAUMBACH CAP SCREWS

WRITE FOR FULL DETAILS OF BAUMBACH'S AUTOMATIC ALIGNMENT WITH PAT'D. DEMOUNTABLE LEADER PINS, BUSHINGS

DIE SET, LAYOUT SHEETS AND CATALOGS FURNISHED UPON REQUEST

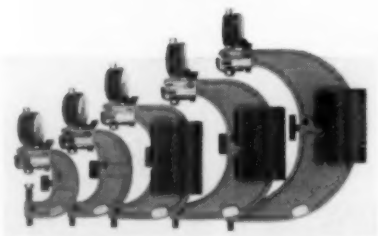
Side Thrusts and Friction Don't Affect this SNAP GAGE

Because the Dial Indicator is fr
. . . while measuring the dimensi



UNAFFECTED BY SHOCKS AND FRICTION

The flat spring supporting the contact point takes all the shocks and side thrusts — the indicator contact point merely rides on the gage contact point. There is no tendency for the indicator spindle to bind. Counterweight spring offsets weight of gage and of inspector's hand.



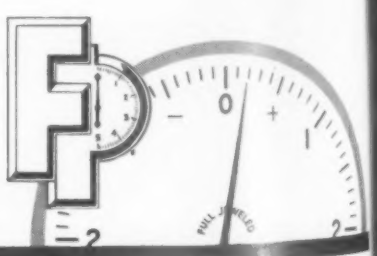
Model 1000 P-1 (0" to 1")
Model 1000 P-2 (¾" to 2")
Model 1000 P-3 (1¾" to 3¼")
Model 1000 P-4 (3" to 4½")
Model 1000 P-5 (4" to 6")
Price, any one gage with .0005" grads. $57.50
Price, any one gage with .0001" grads. $75.00
Larger sizes special

FEDERAL MODEL 1000 SERIES GAGES *show you the amount of error* so you can make corrective adjustments *before you begin to produce scrap.* Measurements are not influenced by "feel" and any operator obtains the same reading. These gages are fast, lightweight, and more accurate than conventional "go, no-go" gages.

Five gages enable you to inspect *all* dimensions from 0" to 6". There are no extra gage costs when size requirements change — Adjustments can be made easily with a screw driver! Write for folder on these modern gages. Federal Products Corporation, 1194 Eddy Street, Providence 1, R. I.

FEDERAL

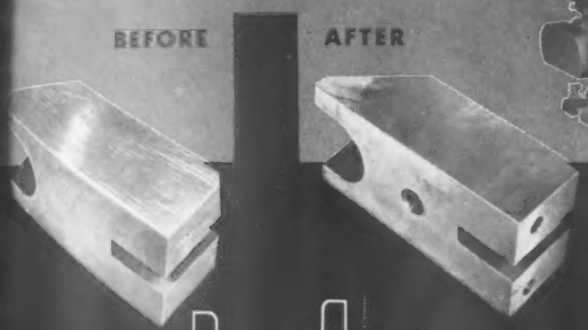
Largest manufacturer devoted exclusively to designing and manufacturing *all types* of DIMENSIONAL INDICATING GAGES

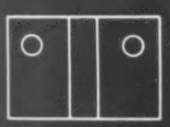


NATCO HOLESTEEL deep hole step-driller and counterborer

Automatic Safety Interlocking Tool Rack

PART: BREECH BLOCK





Safety interlocking requires each tool be used in proper sequence before machine will operate.

OPERATIONS:

- Step Drill
- Core Drill
- Counterbore one diameter
- Counterbore second diameter

Natco Engineered for Quality Production

Call a Natco Field Engineer

to help you solve your problems in Drilling, Tapping, Boring and Facing

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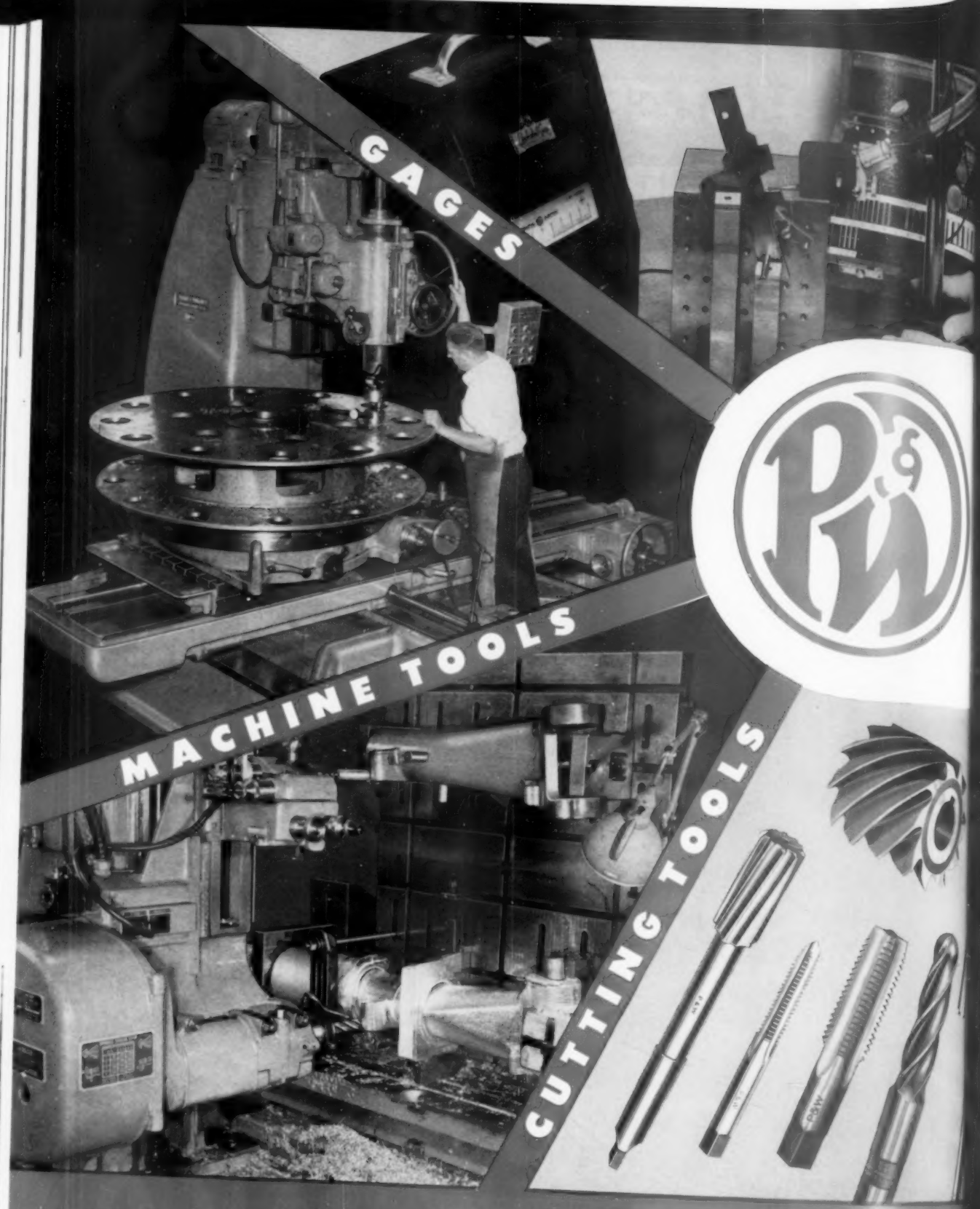

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Backbone of America's industrial might is her power to mass produce, to create more and better things at lower cost. Modern mass production, involving the highly accurate duplication of components, depends in turn on the basic ability to measure with millionth-of-an-inch accuracy. This ability is, to a great degree, the result of Pratt & Whitney's establishment of the standard inch, accurate to millionths, and the creation of the Standard Measuring Machine nearly 70 years ago.

Today, the highly integrated Pratt & Whitney plant of over 1,060,000 square feet houses a wealth of skill, knowledge and experience. The expert craftsmen and specialists in the several divisions of this unique organization . . . working as a team and with complete interchange of technical knowledge and proficiency . . . design, develop, prove and produce a wide variety of Pratt & Whitney precision Machine Tools, Cutting Tools and Gages . . . the finest ever made to meet the exacting demands of industry.

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Production News

ABOUT *Lusol*.. —THE ALL-CHEMICAL METAL-WORKING SOLUTION

FROM F. E. ANDERSON OIL COMPANY · PORTLAND, CONNECTICUT

"I've never seen anything that works like Lusol!"

The foreman in one of Ohio's finest machine and tool plants pointed out machine after machine "working better with Lusol". "We change this form tool every twenty-four hours, whether it needs it or not," said the day man on a lathe. "Used to make three strokes on a deep drilling operation; do it in one with Lusol," said another.

"Grinding wheels require less dressing, finishes are finer—thread chasing and tapping go fast, without tearing—no dermatitis, no odors, no rusting;" with reports like these all through the shop, no wonder they've practically standardized on Lusol for machining and grinding.

"Look how clean these threads are, and our chasers and taps last a lot longer with Lusol".

★

Stamping with Lusol

This is one of the newer uses for Lusol. Its high film strength gives it lubricating properties under extreme pressure . . . safeguards both the tools and the products while decreasing down time for die maintenance.

Since Lusol contains no oil, parts come off the presses clean, without foreign particles clinging to them. Handling and finishing is easier and less costly. There's no smoking to make surroundings disagreeable. Work and dies run cool.

users say*

case histories of Lusol at work

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The Tool Engineer

a Letter from the Editor...

ASTE's Board of Directors, at its annual meeting in Chicago, announced formally the dates for the Society's first Leadership Conference, March 17-21, 1953, in Detroit.

As previously announced, the Leadership Conference will bring together the chairmen-elect from all of ASTE's far-flung chapters for a two-day session of discussions on both national and chapter affairs. Chairmen or representatives from ASTE's national committees will explain in detail their objectives and operations, and their relation to similar committee structures on the chapter level. The joint work of national headquarters and chapter officers is included, as well as the liason necessary to establish smooth functioning of a technical society of the order of ASTE.

The Conference is brought up here because it deserves far more than ordinary news coverage. It is a milestone for ASTE, and one of the rare attempts of its kind to provide local and national officials alike an opportunity to better understand all of the complex elements of our society.

If it succeeds—and its success will be measured by the understanding that all participants take home with them—it represents the most direct form of communication that is practicable. Its direct result will be an organization which, while geographically separated, can think and work as a team on all levels.

Gilbert P. Muir

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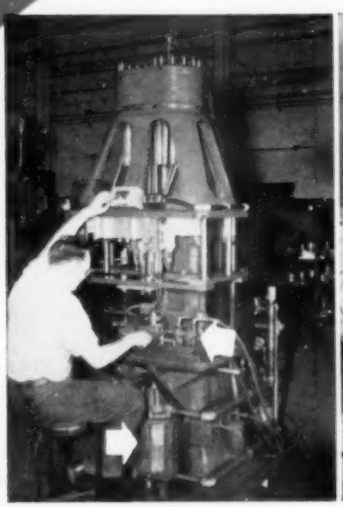

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The Tool Engineer

Editorial

Research Can Earn Dollars, Too

Continuous, well-planned and intelligent manufacturing research is a basic prerequisite to an increasingly higher standard of living. Not only has ASTE recognized this, but has increased from $25,000 to $50,000, at its Chicago meeting, the original appropriation to further investigate research programs. In addition, larger segments of industry, as pointed out in this and in the preceding issue of *The Tool Engineer*, are gaining important dividends from this investment.

Manufacturing research is in many respects tool engineering research. It is not a fundamental investigative activity dealing in abstracts. Rather it is devoted to scientific study of new tools, methods, machines, management controls, and new materials and applications for them, to name a few.

It is an activity which is well described by J. L. McCaffrey, president of International Harvester Company, in commenting on the management policies which led to the establishment of International Harvester's manufacturing research department: "We are determined to keep our place in the present industrial scheme of free enterprise. We know we can do that only by building the best possible products in the most economical way . . . Alert competition will have available from its own research the means to improve its products and reduce its costs. We do not propose to be at a competitive disadvantage in this respect. In a broader way, Harvester considers it has an obligation to its customers to apply the enormous benefits that flow from research."

ASTE, in readying its research program for service to industry, is well aware of the dollar dividends that accrue from well-directed research. Dollars saved in manufacturing as a result of a materials change, better tools, an improved process, standardization of tools, an improved machine. This activity is a tool of the tool engineer, and, employed as such by him, can be a substantial contributing factor to the profit statement.

L. B. Bellamy

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Electroforming Produces Intricate Shapes to Close Tolerances

By Charles L. Faust and William H. Safranek
BATELLE MEMORIAL INSTITUTE

ELECTROFORMING IS a process in which a thick layer of metal is electrodeposited on a mandrel or matrix which can later be removed so that a self-supporting shell, sheet or formed article is obtained. Electrotyping is included. In addition to this basic definition can be added the cladding of metal parts by electrodeposition to provide special surface-metallurgical properties, replacing locally worn surface metal by electrodeposition, replacing metal erroneously machined away, and shaping of parts by electrolytic machining.

Industrial electroforming ranges from turning out thousands of identical items in mass production to producing only a few highly precise pieces in custom production. The process is used in the electronics, aircraft and automotive, machine tool, plastic, graphic arts and chemical industries. Table I shows some of the advantages of the process.

The list of metallurgical processes for manufacturing a product should include electroforming. It takes place at low temperature and with no mechanical action on the metal. Any metal for which an electrodeposition method is known is available for electroforming. These metals include copper, nickel, iron, cobalt, zinc, brass, chromium, lead, lead-tin, tin, cadmium, silver, silver-lead, gold, platinum, and, most recently, aluminum.

Electroforming Process

The electroforming process involves mechanical, metallurgical and electro-chemical factors as well as knowledge of design, operation and control. There are two types of electroforming which are concerned with either the production of articles consisting of essentially the electroform and requiring removal of a matrix or a mandrel from the inside or the production of articles which remain a composite of the basis metal and the thick electrodeposited surface metal. The first type includes products such as radar components, aircraft pitot tubes, fountain pen caps, molds or dies for plastics molding and precise screens. The second type of product is exemplified by aircraft engine bearings with thick, electrodeposited silver or silver-lead alloy liners, automobile engine bearings, and pipe with electroclad inside lining or outside covering for chemical plant service.

The following sequence of operations is necessary when electroforming hollow parts of the first type mentioned: design of the item; production of a negative or mirror image of the item, i.e., a matrix or a mandrel; preparation of the matrix for electrodeposition; separation of the matrix from the electrodeposited layer of metal.

The basic form for a shell can be non-metallic with the surface made to be an electrical conductor, or it can be a metal differing greatly from that of the shell in melting point or chemical solubility. It can also be made from a solid permanent metal. These basis forms are known as matrixes or man-

Fig. 1. From left to right are shown a fountain pen cap, as formed, in a modified Watt's nickel bath; as formed from cobalt-nickel alloy; as formed from silver-lead alloy; and an electroformed nickel cap, after Butler finishing.

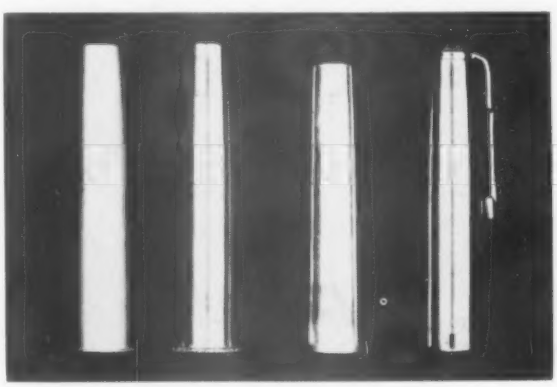


TABLE I—ADVANTAGES OF ELECTROFORMING

Class of Article	Advantages of Electroforming	Electroforming Metal
Low-cost, mass-produced shapes of simple design.	Uniform wall thickness, no intermediate anncaling and no seams or joints.	Copper, iron, zinc, brass, lead, lead alloys.
Same as above, but allowing higher materials cost.	Uniform wall thickness, no intermediate annealing and no seams or joints.	Nickel, nickel alloys, silver, silver-lead, gold and gold alloys.
Mass-produced or custom-produced intricate shapes, liberal dimensions.	Parts with return bends made without expensive coring for casting or without joining; uniform bore inside passages and openings.	Iron, copper, nickel, brass, nickel alloys, zinc, silver, silver-lead, lead and lead alloys.
Same as above, but requiring close inside dimensional tolerances.	Inside dimensions secured by accurate outside work on mandrel surface; sharp corners; insert items inside of hollow part; outside dimension held as on bearings.	Iron, copper, nickel, brass, nickel alloys, zinc, silver, silver-lead, lead and lead alloys.
High-quality inside finish.	Permits quality of finish desired to be put on outside of mold which produces same finish on inside of the electroform.	Iron, copper, nickel, brass, nickel alloys, zinc, silver, silver-lead, lead and lead alloys.

drels. They are removed after electroforming to leave the shell of electrodeposited metal in the proper shape or form. Producing these matrixes or mandrels demands a knowledge of mechanical or metallurgical methods, depending on the material, shape, size and quantity required.

The mandrels and the plating tanks are the tools used for electroforming. They take the place of the presses and dies that are the tools in the stamping room, or the furnaces and molds used in the foundry. The permanent mandrels are made by conventional machining methods. The temporary mandrels are cast, either in high-melting metal, or graphite molds, or in sand, depending on the surface smoothness requirements. Selection of the matrix or mandrel and the method for making it are based on product dimension, shape and surface finish or design.

Metallurgical knowledge is required in choosing the correct metal if the mandrel is to be metallic. The use of a temporary mandrel requires a choice among many alloys, based on melting point, castability, porosity and machinability. The low-melting alloy must not diffuse with the metal to be electrodeposited and must be reclaimed for re-use; low-melting lead-bismuth eutectic, cadmium-nickel, lead-tin, and other alloys are used for melting out. Zinc and aluminum are used where the mandrel is to be dissolved out. Die castings have production advantages.

Permanent mandrels must be sturdy enough and hard enough to withstand repeated use without frequent resurfacing or replacement. Stainless steel, aluminum, passivated nickel, chromium-plated hardened steel and glass are used. In addition, such non-metallic materials as rubber, plastics, wood and plaster are being used to advantage.

If an item is to be electroclad with a thick electroplate (thick in comparison to decorative or corrosion-protective plate) for engineering use, the basis form stays with the finished item as an integral part of it.

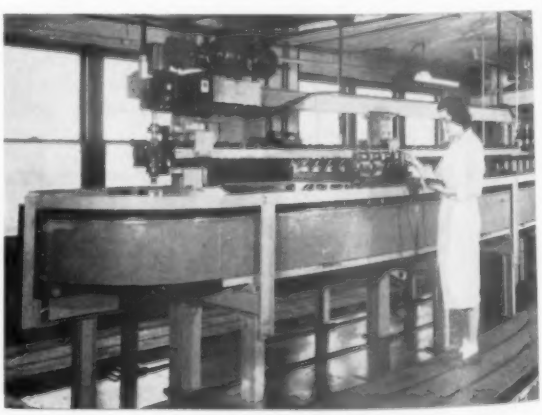
At the electrodeposition stage, the electroforming operations are basically the same for producing shells as for applying liners on bearing backs or for wear-surfacing shafts. The principles are those of engineering plating. The properties of the electrodeposited metal must be known and the conditions for producing it uniformly must be understood. The satisfactory electroform requires a knowledge of the properties of the electrodeposited metal and of the electrodeposition factors.

A typical product which can be produced by electroforming is shown in Fig. 1. The machines for producing this item, a fountain pen cap, are shown in Figs. 2 and 3. Here a permanent mandrel, having an external shape with the same dimensions as the internal shape of the pen caps, is used. The permanent mandrels are used repeatedly without change or destruction.

Temporary mandrels are used only once and are destroyed in being removed from the electroform. One of the newer products to be manufactured by the electroforming process is aluminum waveguide segments. See Fig. 4.

In the tank where the electrodeposition takes place, solutions and operating conditions are the same as those for electroplating. Good results require knowledge of how the various plating control factors influence the physical properties of the electrodeposited metal. Properties attainable in electrodeposited metals are shown in Table II. Engineering plating experience is required in reproducing those properties.

Fig 2. The machine shown here is used for electroforming fountain pen caps.



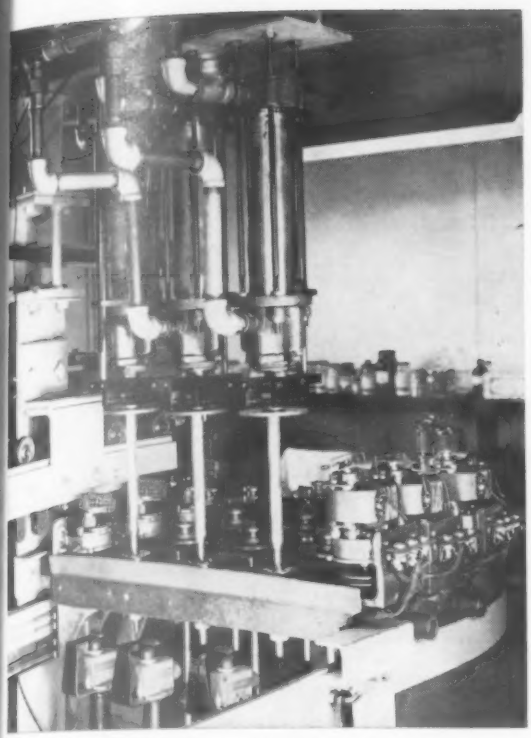


Fig. 3. Here is the stripping station for removing electroformed fountain pen caps from the machine shown in Fig. 2.

The general electro deposition operation is shown schematically in Fig. 5. The electrodeposition solution requires chemical control for proper balance of composition, and requires temperature and electric current control. The placement of the anodes relative to the mandrels is critical, but is not impractical, for the uniform placement of metal on the mandrels. These relationships of electrodeposition technology are in daily use.

The same equipment and methods described above also can be used in electroforming thick metal surfaces (electrocladding) on parts for which the electrodeposited surface and the basis metals remain together in the product. One exception is that after the final rinse, it is necessary to perform an additional operation known as stripping. Preceding the alkaline cleaner, another step, surface preparation, is also needed. The engineering properties of the final part depend on the proper surface condition as produced by polishing, grinding broaching, machining, etc.

Properties of Electroformed Metal

The physical properties of electrodeposited metals depend upon the proper selection of solution composition, temperature, electrical current density, design and shape of the part, and placement of the electrodes in the depositing tank. Table II shows the physical properties that can be obtained regularly in metals available for electroforming.

The range of properties available in electrodeposited metals shows the necessity for analysis of requirements in an electroform and the necessity for knowledge of the electrodeposition conditions. The properties can be selected from a range that is wider than that for wrought metal. Electrodeposited metals are, like other metals, amenable to heat treatment, and as-deposited properties can be changed.

Costs of Electroforming

Regardless of the technical feasibility and reproducibility of an electroforming application, the costs will determine whether the process should be used. Usually, when a standard casting or forming method can be used to make items quickly on automatic machines (die-casting, press-forming, extruding) with no problems of close tolerance for dimensions or difficulty in surface finish or design, electroforming cannot compete on a cost basis. Yet there are exceptions. Cold forming which requires several intermediate annealing operations, or castings that have costly molding and coring, although feasible, can easily be more costly than electroforming. Fountain pen caps in nickel, for example, cost about one-half as much by electroforming as by extruding into tubing form and then cold forming to shape in nickel or stainless steel.

There are parts for which electroforming is the only successful method. Such parts are those with intricate surface design for which detail would be lost by stamping or casting, such as dies (stamps) for reproducing wax recordings, electrotypes for printing, pitot tubes with internal re-entrant angles and

Fig. 4. Waveguide segments are one of the newest items to be produced by electroforming.

TABLE II—PROPERTIES OF ELECTRODEPOSITED METALS FOR ELECTROFORMING

Metal	Hardness Vickers	Tensile Strength, Psi	Elongation, % in 2 in.	Stress in Tension, Psi
NICKEL				
Watts bath	140- 160	50,000- 66,000	30-38	5,600- 9,800
Sulfate-ammonium chloride bath	400- 430	144,000-160,000	5- 9	36,400-38,400
Chloride bath	230- 260	99,000-110,000	13-20	18,000 –
Chloride bath, annealed	320	80,000	30	No data
Watts, vac. ht. treated	70- 85	45,000- 55,000	50	No data
Watts, hydrogen annealed	40- 45	40,000- 43,000	50	No data
COPPER				
Acid Sulfate bath	81	36,000	22	0- 1,400
Fluoborate bath	67	17,000- 34,500	3.5- 8	No data
Rochelle-cyanide				8,700-14,700
Acid sulfate, cold worked	65	Up to 102,300	40	No data
IRON	225- 350	50,000-110,000	5-20	No data
COBALT, sulfate bath	150- 375			No data
SILVER, cyanide bath	50- 120	Up to 35,000	Up 30	
CHROMIUM	300-1,050	15,000- 54,000	<0.1	35,000-50,000 (after cracking)

inserts, and radar wave transmission pipes for which a mirror-like, as-optically-flat-as-possible surface is desired and for which corners must be square. There are many such examples. Bearings are examples of a different kind. Silver is electrodeposited up to 0.060 inch thick on steel shells to give a bearing liner superior, in heavy-duty performance, to cast silver, and any other cast bearing. Liners, such as silver-lead alloy, that cannot be made by thermal methods are electroformed in place on bearing shells. Automobile bearing-liner overlays are electrodeposited up to about 0.005 inch thick with such accuracy that no further machining or finishing is required.

These electroforming operations are performed at costs equal to or less than those of other methods (where one is known) for producing the same parts. Equipment costs for electroforming are considerably lower than those for machine tool operations producing the same dollar volume of work. An electroformed mold for imitation leather, rubber soft balls, or footballs, has the leather graining accurately reproduced without very expensive hand engraving. The electroformed mold costs only a small fraction of the design engraving alone, without including the other costs of making the mold cavity.

A trumpet bell electroformed in one piece has far better tone quality than one made by spinning and brazing, and costs less to produce.

The actual dollars of cost by electroforming relative to other methods for making a given item are not defined by any universal formula. There is enough metullurgical, mechanical and electrochemical engineering experience now in the hands of some electrodepositors to enable a realistic appraisal of any potential application.

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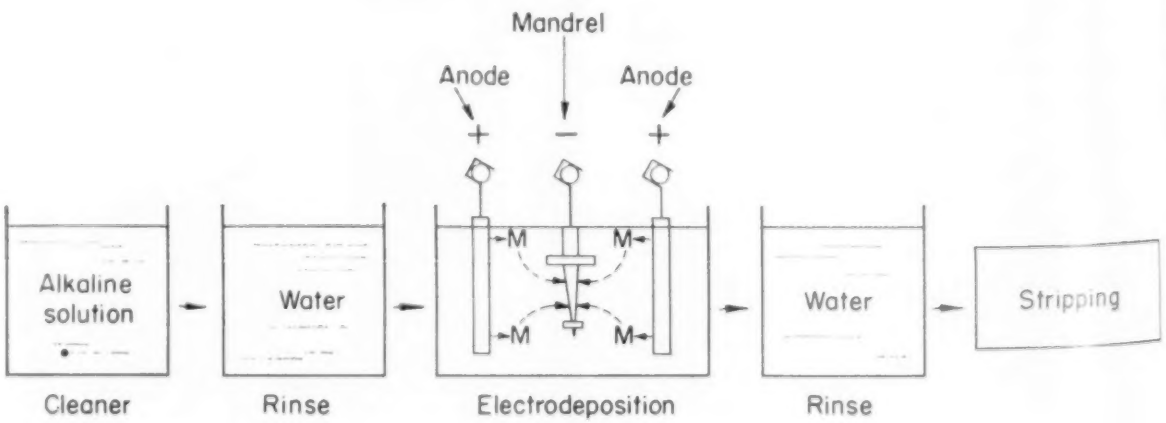
Pictures—Courtesy of *Plating* and the Electrochemical Society

Fig. 5. Sequence of steps in the electroforming process. In the electrodeposition tank, the metal, M, dissolves from the anodes and enters the solution to replace that which electroplates onto the mandrel.



Selection and Treatment of Die Steels

By Stewart G. Fletcher

CHIEF METALLURGIST
LATROBE ELECTRIC STEEL COMPANY

Part I

THE PROBLEM of the selection of the proper die steel for a given application, and then choosing its correct heat treatment for maximum die life is extremely complex. This complexity arises partially from the general aura of mystery that has traditionally surrounded heat treatment.

However, today mysteries of heat treatment contribute only a relatively small part of the complexity to the die steel problem. Most of it stems from the large number of die steels on the market, and the general lack of a systematic classification of these steels. Each tool steel manufacturer and each tool steel jobber has his own steels called by name, and usually claimed to be superior to any other.

Die steels are of many types, and this is logical, for they must perform many different functions. In some applications, such as lamination dies, they must be extremely hard, wear resistant and maintain fine cutting edges over long periods of time. For other applications, such as draw dies, the die steel must be relatively hard, yet tough, and resistant to frequent shock loading. More often than not, the required properties are not compatible, one with the other, and some compromise choice must be made or the die redesigned to take best advantage of the properties of the steel.

When these steels are studied objectively, it is evident that many of them are duplications, at least so far as chemical composition is concerned. They all fall into distinct classifications, and their basic properties within a given classification are the same. To support this, it is necessary only to refer to the comparative grade charts issued by nearly all tool steel suppliers which tabulate the names of steels chemically which are similar within each class.

This similarity often ends at chemical composition, however. It is entirely true that the basic properties and characteristics of a steel are established by its chemical composition. However, much more than chemistry enters into the metallurgical characteristics of the material, and it is these characteristics which determine the final suitability of the die material to the work at hand.

Classification of Die Steels

The basic characteristics of die steels are founded on their chemical compositions. Nearly all classification systems published for them are also based on chemical composition. Over the past decade or two certain analyses have gradually become recognized as standard for the different types of die steel required by industry, but a good, uniform way of coding these grades has not been worked out and accepted by the die steel makers and users together.

This lack of system is soon to be remedied, for in cooperation with the American Iron and Steel Institute, representing the steel makers, and the Society of Automotive Engineers, representing a large segment of die steel users, a simple system of classification is being developed. It also is based on chemical composition, although the various standard analyses are grouped and coded in relation to their most common usages.

The steels most commonly employed in metal-stamping dies are listed in Table 1. The materials listed there represent the vast majority of tool steel being used in metal-stamping dies today. There

Presented at the Twentieth Annual Meeting of American Society of Tool Engineers, March, 1952.

are on the market many more steels in each of the above general classifications, but those listed are the major ones, and the others usually represent only minor deviations from these general analyses.

The compositions range from practically no alloying addition (plain carbon grade) to upwards of 15 percent alloy in some of the high carbon-high chrominum grades. Manganese, chromium and molybdenum exert tremendous effects on the hardenability (or ease of producing high hardness); tungsten is primarily a heat-effect retardant, while vanadium (in conjunction with additional carbon) markedly increases wear resistance.

TABLE I—STEELS FOR METAL STAMPING

	Chemical Composition						
	C	Mn	Cr	V	W	Mo	Co
Water-hardening, Low Alloy							
1	1.00			(.15)			
2	1.00		.50	(.15)			
3	1.25				3.50		
Oil-hardening, Low Alloy							
1	.90	1.00	.50		.50		
2	.90	1.60					
Air-hardening, Medium Alloy							
1	1.00		5.00			1.00	
Air-hardening, High Alloy							
1	1.50		12.00	(1.00)		1.00	
2*	2.25		12.00			(1.00)	
3	1.50		12.00			(1.00)	3.00
4	2.50		12.00	4.00		1.00	

*Oil-hardening without molybdenum.
(Analyses in parentheses are optional.)

The problem of selecting the proper die steel for the job at hand depends on a number of interrelated factors.

Among these factors are length of run required, cost of steel, ease of machining, distortion in heat treating, abrasion resistance required, heat treating equipment available, grinding difficulties, hardness required, availability of steel, ease of reworking, edge strength and resistance to shock.

In discussing each of the basic grades of tool steels used for metal forming and stamping dies, the properties influencing the selection of the proper die steel composition will be considered in their relation to these quality factors.

Water Hardening, Low Alloy Die Steels

These materials are usually used in operations requiring relatively short runs, for their abrasion resistance is somewhat lower than the others. They are shallow hardening, which in many instances is a determining factor in their selection.

For example, cold header dies are most frequently made of straight carbon tool steel. It is well adapted to the shock loading characteristic of cold heading operations, silverware striking dies, and coining dies for, when heat treated, a relatively thin but hard and strong working surface is developed on a medium-hard, tough, resilient backing.

The straight carbon steels may also be used for trimming dies, or forming dies where only a short life is necessary, and the cost of the die steel represents a major factor in the cost of the parts produced. But the carbon steels are rather difficult to heat treat without distortion, and this factor alone rules them out for many types of dies. They have only moderate resistance to abrasion, and will soon lose their cutting edge through wear. Because of the composite hardening characteristics, few regrindings can be employed before the hard, wear-resistant surface layer is removed. They also are not resistant to heat, and if they should become hot in operation, the desired hardness and cutting characteristics soon vanish.

One modification of the carbon steels which deserves special mention is that containing about 3.5 percent tungsten. This grade, which is made in both water and oil hardening modifications, possesses very good abrasion resistance because of the multitude of fine iron-tungsten complex carbide particles produced. The surfaces of properly heat-treated dies often exceed Rockwell C 67 in hardness, and as a result the coefficient of friction is extremely low.

This modification, however, is quite brittle, particularly at the high hardness levels which bring out its best properties, so it must be used with great care, and only in dies which are provided with good alignment and adequate backing. It also becomes soft when exposed, even only briefly, to high temperatures in operation (over 300 deg F), and thus will lose its keen cutting edge. Distortion again is relatively severe in heat treatment, and because of this, complex precision dies cannot easily be made from this grade of steel.

The carbon steels can be hardened from relatively low austenitizing temperatures, 1420-1600 deg F, and are almost invariably water quenched. The high rate of cooling required to produce full hardness also tends to promote excessive distortion in dies of any but the simplest shapes. Irregularly shaped dies, particularly those with thin sections adjacent to heavy sections, are also liable to cracking; the heat treater sometimes must use all sorts of tricks to prevent this cracking or severe distortion. Tempering must follow immediately after quenching, or again the material is liable to crack from the very high internal stresses set up by the water quench.

Summarizing the characteristics of carbon or water hardening steels for dies, it may be said they are best used for relatively short runs; the steel is inexpensive, readily machinable, easy to grind and obtains high hardness. However, it is subject to severe distortion or even cracking when hardened in irregular sections, the edge strength is not high, and it is not very resistant to shock unless hardened to a relatively shallow depth.

temperatures are necessary (1750 deg F vs. 1500 ... the die sets must be of the ...

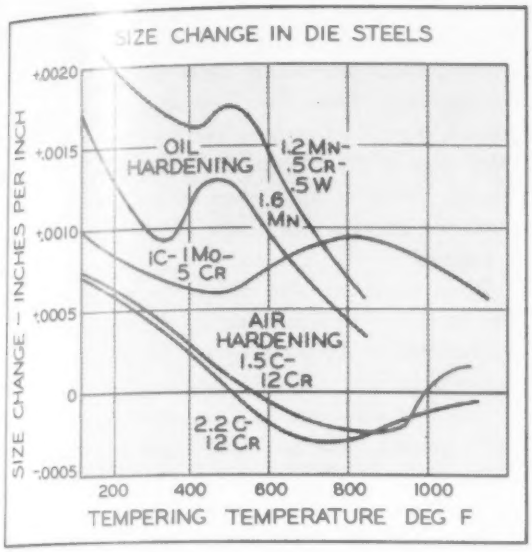


Fig. 1. Size change obtained in heat treating the common die steels. This data is based on normal hardening temperatures for each grade.

Oil Hardening, Low Alloy Die Steels

The two principal improvements over carbon steel demonstrated by the oil hardening die steels are relative freedom from distortion and size change in hardening, and relatively deep hardenability.

The former of these resulted in the use of the terms non-deforming, non-shrinking, etc., for these materials and many of the trade names covering these grades reflect these characteristics. The addition of manganese, with or without the additional small amounts of chromium and tungsten has, in fact, produced a steel which, when properly heat-treated, comes out with very little or no size change and distortion, compared to the water hardening steels. Actually, the higher alloyed steels are today better in this respect than the oil hardening varieties, but at the time of their introduction, the manganese oil hardening die steels could be classified as non-deforming.

These materials usually provide better die life than the water hardening steels. The addition of alloying elements, particularly chromium and tungsten, increase the resistance to wear. More important, they are deep hardening, usually through the entire section and this often results in better die performance. On the other hand, since these grades harden through their whole cross-section, they obviously do not have the resilient back-up material provided naturally in the water hardening steels. Consequently they must be used much more carefully, the dies aligned better, and proper measures taken to insure freedom from excessive shock. The shock resistance is not nearly as high as the water hardening steel with an unhardened core.

For moderate production runs the manganese oil hardening steels are preferable, and are popular die materials. General purpose trimming dies, blanking dies and even some sectional dies are often made of this class of die steel. These steels are relatively low in cost, easy to machine, fairly easy to heat treat without undue size change except in the most precise work, and have moderately good resistance to wear and resistance to shock. In many of these characteristics the manganese oil hardening steels represent the best general compromise of properties, and large tonnages are used for general purpose die work, usually not involving long production runs. This general demand results in good availability of the steel, for it is advantageous for suppliers to carry extensive stocks in these grades.

Air Hardening, Medium Alloy

A further step up the ladder of improved die life is taken by the air-hardening medium-chromium medium-carbon steel (1.0 percent carbon, 5.0 percent chromium, 1.0 percent molybdenum). As the addition of manganese slowed heat-treating reactions enough to make the steel oil hardening, the addition of 5 percent chromium and 1 percent molybdenum renders the material air hardening. For the precision die builder, this is a tremendous step forward. Distortion and size change resulting in heat treating is still further reduced, and more complex, more precise dies can be made without running into excessive reworking or finishing after heat treatment.

TABLE II—RESISTANCE TO ABRASION OF VARIOUS TYPES OF DIE STEELS

Type of Steel		Hardness Rockwell C	Percentage of Material Abraded*
Water Hardening	Steel No. 1	65.5	121
Oil Hardening	Steel No. 1	63.5	106
Air Hardening, Low Alloy	Steel No. 1	60.0	100
Air Hardening, High Alloy	Steel No. 2	62.0	58
Air Hardening, High Alloy	Steel No. 4	64.0	7

*Based on Air Hardening, Low Alloy Steel No. 1 as 100%

Results from laboratory tests of metal wear vs. dry abrasive.

The addition of chromium and molybdenum has a further salutary effect. It greatly improves the abrasion resistance of the dies. This improvement is shown in Table II, where it can be seen that this type of steel has somewhat greater wear resistance than the oil hardening steels under the particular test conditions involved. The increased resistance to abrasive wear reflects itself in greatly improved die life, especially in applications in which the oil hardening steels cannot last for the duration of the die run.

With these obvious advantages, the air hardening medium alloy steel has a few drawbacks compared to the oil hardening steels. It is not too easily machinable. Thus dies made from this grade are somewhat more expensive. Its heat treatment may be considered to be slightly more difficult because higher

temperatures are necessary (1750 deg F vs. 1500 deg F), and it is very sensitive to the control of hardening temperature. This means that better furnace and pyrometer equipment is required. In addition, the higher temperature demands a greater emphasis on control of the surface during heat treatment, for decarburization and scaling can easily take place if not carefully watched.

These factors can be countered in most cases by improved die life, if long die life is required. The choice frequently is one of economics, but the general trend is away from the oil hardening to the air hardening steels for added performance. This grade is also gradually taking hold as a standard general utility die steel, supplanting the manganese oil hardening grade, particularly in shops doing their own heat treatment.

Air Hardening, High Alloy

These are the high carbon-high chromium steels. Except for the 2.25 percent carbon variety, they are air hardening even in heavy sections. This one grade is oil hardening, but for classification purposes, it is included with the other high carbon-high chromium grades because of its similarities of application.

TABLE III—COMPARISON OF TOUGHNESS CHARACTERISTICS FOR VARIOUS TYPES OF DIE STEELS

Type of Steel		Hardness Rockwell C	Unnotched Izod Impact Strength ft. lbs.
Water Hardening	Steel No. 1	63 (surface)	Over 240*
Oil Hardening	Steel No. 2	60	50
Air Hardening, Low Alloy	Steel No. 1	62	62
Air Hardening, High Alloy	Steel No. 1	61	54
Air Hardening, High Alloy	Steel No. 2	62	24
Air Hardening, High Alloy	Steel No. 4	64	18

*Shallow hardening, with core at Rockwell C 42. Other grades hardened throughout.

The air hardening high alloy die steels are noted for their excellent resistance to abrasive wear; this is the most important characteristic in selecting them for any given die application. As shown in Table II, it is evident that any of these materials will greatly outlast the medium alloy air hardening steel, the manganese oil hardening or the carbon steels. Thus, one of these grades must be the choice for the longest run dies, for as a class they will outwear any of the other types of die steels.

These long wearing tendencies cannot be had without the sacrifice of some other properties, though these properties are usually considered less important. For example, these steels in some cases are not as shock resistant (see Table III) as the other grades. This means the dies must be very carefully built and mated; the presses must be in good order; the die sets must be of the best quality obtainable. Otherwise, misalignment results, and even minor misalignment can lead to early failure by chipping or cracking. Often the dies must be inserted or backed up by a tougher, less hard steel for resiliency and shock absorbency. This practice is becoming common, and, when used to proper advantage, can greatly extend die life before failure by cracking.

These steels are also difficult to machine, though here usually the ends justify the means, for the added costs of die building can be distributed over a much longer run of finished parts.

Grinding also presents a problem, particularly in the 4 percent vanadium grade, and here again is a question of whether added grinding and finishing cost pay for themselves in longer production runs.

These high alloy air hardening die steels exhibit another characteristic which, when properly used to best advantage, can result in very great benefits. They have the least distortion and size change in heat treating of all the various die steels. This is brought out clearly in Fig. 1. Frequently this means that dies can be completely finished to size prior to heat treating while they are still soft and relatively workable. After hardening, little if any clean-up or grinding is necessary, providing the heat treatment is properly carried out, and the surfaces adequately protected from decarburization, carburization or scale formation.

Considering all factors, the high carbon-high chromium die steels are the best available for long run blanking and forming operations. They rank below only carbide dies in the amount of production obtainable, for the high resistance to abrasion, combined with excellent edge strength and low galling tendencies, add up to the best possible die steel. It is not inexpensive to build intricate dies out of these complex steels, nor is it always easy to heat-treat them to best advantage. But if sufficient care is maintained in making the die, in its heat treatment, and in its set-up, exceedingly long life can be expected with a very minimum of maintenance.

Other Die Steels

Many other steel compositions are used in metal stamping dies, but the ones discussed above represent by far the greatest consumption.

Some of the other steels worthy of mention in passing are the high-speed steels, with both normal and lower carbon contents, which are gradually attaining prominence as die inserts in cold heading, and for certain types of trimmer dies; the shock-resisting steels which usually contain nickel and are sometimes used in metal forming dies requiring very great toughness with not too great wear resistance, such as in cold hobbing dies and certain types of coining, metal stamping and bending dies.

Drill Jig Design for Secondary Operations

By Joseph I. Karash
PROCESS ENGINEER
RELIANCE ELECTRIC & ENGINEERING COMPANY

Part I

THE TERM SECONDARY operations as used here is intended to cover tapping, reaming, counterboring, spotfacing, countersinking, and related operations. See Fig. 1. Various examples of jig design, in which the secondary operation is performed without removing the part from the drill jig will be used here. Thus, once the drill jig is loaded, the part is not removed until all of the required drilling, tapping, reaming, and other operations have been completed.

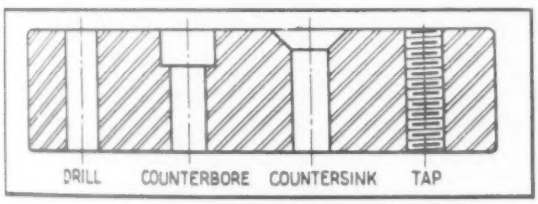


Fig. 1. Secondary operations include drilling, counterboring, countersinking and tapping.

In terms of jig design features, the important point to remember is the fact that all these operations cut a larger diameter than the drilled hole; for example: (1) the tap is larger than the tap drill size; (2) the reamer is slightly larger than the drilled hole to be reamed; (3) the counterbore or countersink is larger than the drilled hole.

Therefore the tool to be used for the secondary operation cannot pass through the bushing used as a contact guide for the drill. Since the purpose here is to consider ways and means of performing secondary operations without removing the piece from the jig, then the principle problem will be to design the jig so as to enable the secondary operation tool (tap, reamer, etc.) to reach the work.

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Fundamental Types of Secondary Operation Jig Features

The following are the basic types of jig design features entering into secondary operation considerations: removable bushing methods using slip bushings and flipper bushings; fixed bushing methods which require through holes and blind holes. In addition there are also step drill adaptations.

Slip Bushings (Removable Bushing Method). Probably the most widely used method of performing secondary operations within the drilling jig is the use of standardized commercial slip bushing arrangements, a representative example of

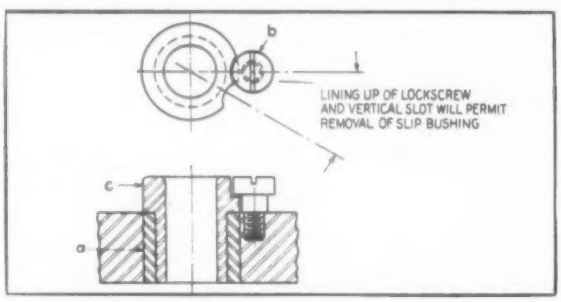


Fig. 2. A standard slip bushing is used most often for secondary operations.

which is shown in Fig. 2. Similar to regular drill jig bushings, the slip bushings and liners can be purchased from stock supplies in almost any standard size.

The slip bushing arrangement consists of three parts; the liner (a), the lockscrew (b), and the slip bushing (c).

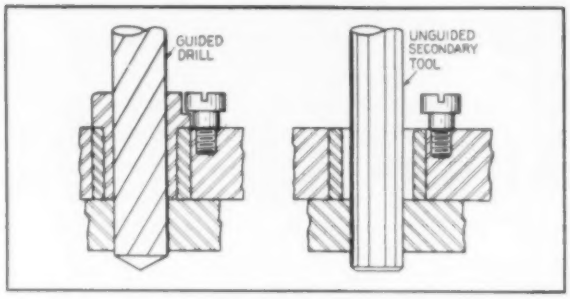


Fig. 3. Shown here is a simple progressive operation using a slip bushing.

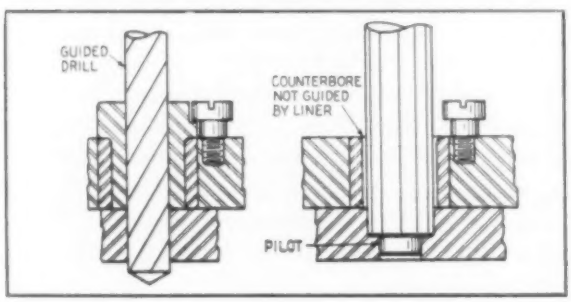
Use of Slip Bushings for Secondary Operations: Shown in Fig. 3 is a simple basic type of progressive operation involving the use of slip bushings. In this example a slip bushing is used to guide only the drill. After the drilling has been completed, the slip bushing is removed to allow the progressive tool (tap, reamer, etc.) to reach the work. No interchangeable slip bushing is provided in this instance to guide the progressive tool, the drilled hole itself being used as a guide for this purpose.

Tapping. This method as shown in Fig. 3 may be readily used for drilling and tapping operations. The drilled hole will accurately guide the tap. The cutting action will force the tap into a fairly true central position with relation to the drilled hole.

It would be impractical, if not impossible, to actually guide the tap with a bushing. The tap should be free to follow the drilled hole. If a slip bushing were used to force the tap into a true position, the tap might scratch against the hard bushing and cause breakage.

Counterboring. This same method (Fig. 3) is often used for counterboring, since it is ordinary shop practice to use the drilled hole for guiding the piloted counterbore. Counterbores are provided with a pilot which leads the counterbore as shown in Fig. 4. This pilot is a slip fit in the drilled hole and prevents the counterbore from "running out" with relation to the drilled hole.

Fig. 4. Here the counterbore is being led by a pilot which is a slip fit in the liner.



It would be unusual to see a conventional counterbore being actually guided with a slip or fixed bushing. The counterbore itself is not designed for this type of operation. The counterbore is also usually considerably larger than the drill size, so that it would require special interchangeable slip bushings to allow the OD of both bushings to fit the ID of the same liner.

Countersinking. It is at times practical to accomplish countersinking operations by first drilling and then using an oversize drill for the countersink. Shown in Figs. 5 and 6 are two slip

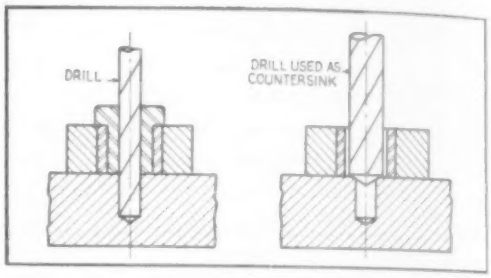


Fig. 5. A drill can be used for counter-sinking without the bushing when tolerances permit.

bushing methods for performing this operation.

In Fig. 5, the hole is first drilled using the slip bushing to guide the drill as shown. The slip bushing is withdrawn and an oversize drill is used to perform the countersinking operation. The oversized drill is not guided but is only approximately centered in the previous drilled hole. This manner of locating the countersink is practical only for operations of loose dimensional tolerance.

In Fig. 6 the operation is the same except a slip bushing is used to guide the large drill used to perform the countersinking. On this type of operation the liner and large slip bushing can be standard purchased items. The bushing used to guide the small drill will have to be made special because the small drill and large drill are too radically different in size to be bought to fit the same liner. This type of removable bushing method can be used when the location of the drilled hole and the countersink must both be guide-located.

Counterboring with Ordinary Drills. In some instances, the bottom of the counterbored section need not be square. In such a case the counterboring may be done with an ordinary drill as shown in Fig. 7. The drilled hole will provide only an approximate guide for the larger drill doing the counterboring. There may be appreciable "run out" between the drilled and counterbored holes with such a method of operation.

Reaming. The method shown in Fig. 3 may be used for drilling and reaming operations only if the hole location tolerance permits. Dimension

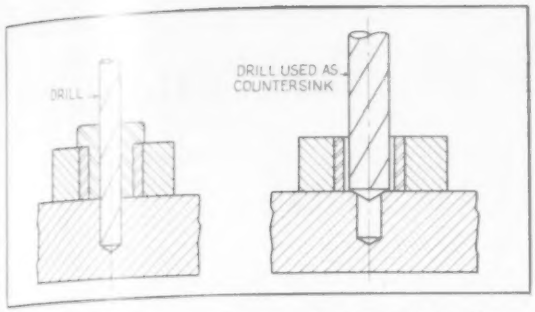


Fig. 6. When accuracy is demanded, the drill, when used for countersinking, must be guide-located.

tolerances are classified into two groups, size of hole and location of hole.

If the purpose of reaming is to provide only a smooth hole, or a hole of exact diameter, then the method shown in Fig. 3 should be entirely satisfactory.

However, if there is a close "location" dimension tolerance (exact hole position), the method shown in Fig. 3 will not be satisfactory, and the

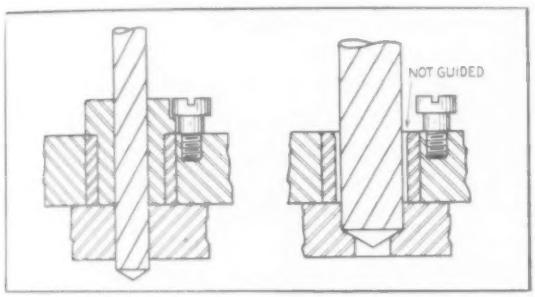


Fig. 7. When the bottom of a counterbored section need not be square, the operation can be done with a drill.

method shown in Fig. 8 may be used instead.

In this example a second interchangeable bushing is slipped into the liner after the drill bushing has been removed. Thus one bushing (the smaller) is used to guide the reamer. When using this method, constant vigilance must be exercised by the operator to keep from mixing the bushings. If the reamer is started into the drill size bushing, which is actually smaller in diameter, the cutting lips of the reamer will be chipped or broken. On the other hand, if the drill enters the reamer bushing, the drilled hole will not be accurate with regard to location.

In cases of close location tolerance, it is necessary to guide the reamer; otherwise the reamer may creep slightly away from the true drilled hole position. This "location" inaccuracy would be very small. Consequently it would really be necessary to use a slip bushing for guiding the reamer only when this creep could exceed the "location" dimension tolerance.

In choosing between the method shown in Fig. 3 and that in Fig. 8, it must be remembered that there is little justification for doing too good a job. If the unguided reamer will produce an entirely satisfactory job, there is no point in providing and juggling an extra slip bushing.

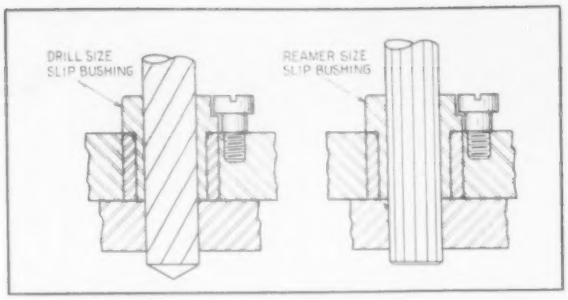


Fig. 8. Here a second interchangeable drill bushing has been slipped into the liner after the drill bushing has been removed.

Flipper Bushings (Removable Bushing Method). The flipper bushing is a simple variation of the slip bushing, and both accomplish essentially the same purpose. After guiding the drill, they are both removed for the next operation. It is the mechanical means of removing them that makes the difference. The slip bushing is wrung out of the jig, whereas the flipper bushing is swung over and away from the drilled hole.

Shown in Fig. 9 is a simple example of the use of a secondary tool in a hole which has been drilled by the use of a flipper bushing.

When a flipper bushing is used, and both the drill and reamer are guided, this is accomplished

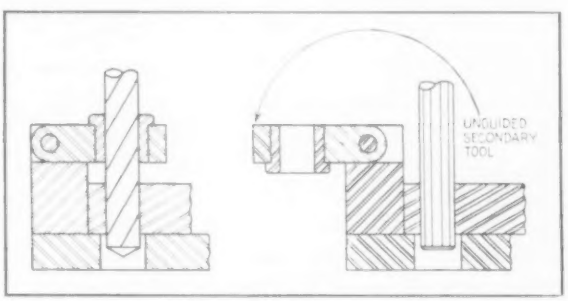


Fig. 9. This is a simple example of the use of a secondary tool in a hole which has been drilled using a flipper bushing.

by using two bushings. The drill-size bushing is used in the flipper plate while the reamer-size bushin is in the jig body. In operation, the hole is drilled through the flipper bushing. The drill will readily pass through the reamer-size bushing because that bushing is larger in diameter than the drill. The reaming is accomplished by swinging the flipper clear. The reamer can then be guided into the hole by the lower bushing. The flipper plate is easily available when again needed and is not detached from the jig.

(Continued next month)

Electro-Mechanical Machining of Hard Materials

By Malcolm F. Judkins

CHIEF ENGINEER
HIGH TEMPERATURE ALLOYS DIVISION
FIRTH STERLING STEEL & CARBIDE CORPORATION

UNTIL THE RECENT PAST, the metalworking done with tools involved cutting penetration and removal of material with the tool's working surface or edge, forming or cutting away the workpiece in pieces or chips, requiring that the tool be harder than the work at the cutting temperature. There has been a constant evolution toward harder, more durable, and more productive tools to permit cutting, fashioning, shaping and finishing of harder and more durable materials at ever increasing rates of cutting and lower costs.

Conventional Processes

Conventional fabrication processes include casting, in which melted metals are solidified in molds, but the resulting ingots require further finishing by forging, rolling, drawing, extruding, stamping, machining, grinding and honing, polishing or lapping. For certain limited classes of service, precision investment and die casting products can be used without further finishing, particularly for low-stress service and for the low-melting-point, low-strength metals like aluminum, zinc, and copper. Forging, rolling, drawing and extruding by pressure or impact-shaping usually requires further finishing by machining, although for certain purposes, precision forgings may be used as is.

Machining or tooling involves the application of mechanical forces to push the tool edge into the work, removing chips or shavings. Grinding and polishing involves the use of sharp abrasive grains which actually cut the material, removing chips or grindings. A grinding wheel is actually similar to a milling cutter with an almost infinite number of teeth. Grinding is usually slow and expensive. Unless great care is observed, thermal shock may generate cracks which impair the usefulness of the article. Flame cutting, using the oxygen gas torch, melts and burns the metal in blasting out the kerf, leaving rough uneven burnt edges requiring extensive finishing.

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Arc Disintegrations

This process involves metal-to-metal contact between the work and electrode with heavy current flow, then separation of the components to draw or strike the arc which persists. This process results in poor accuracy, with the necessity of leaving stock to remove the damaged metal. The supersonic abrasive method using a solenoid energized with more than 10,000 cycles per second alternating current reciprocates a soft iron armature mounting a tool or stencil. A chisel action upon the work is performed under a suspension of a granular abrasive such as boron carbide. This process has a limited scope and application to engraving or other shallow penetrations. It is excessively slow for through or threaded holes and exterior shapes, but it can be applied to non-metallic materials which are so highly abrasive that other machining methods do not apply.

Electrolytic Spark Machining

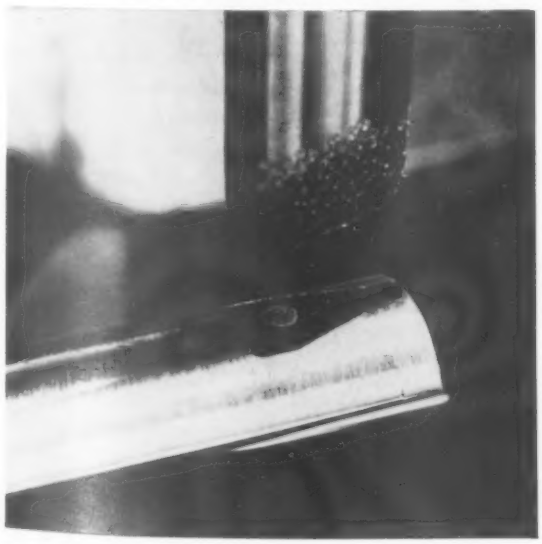
Considerable work is being done on an electrolytic spark machining process which is primarily adapted to cutting off or surfacing operations such as the grinding and re-sharpening of cutting tools. There is every indication that this process may materially help to conserve critically short diamond-impregnated grinding wheels. In its simplest form, this process involves the use of a thin (0.040-in. thick) low-carbon steel disc revolved by a suitable motor at about 23 fps while partially submerged in an electrolyte composed of a 1.335 specific gravity aqueous solution of sodium silicate. The work is supported on a counter-balanced arm so that gravity can be used to lift the work through the wheel for parting. The wheel is made the negative terminal and the work, which is insulated from the machine structure, the positive terminal, with an applied potential of perhaps less than 20 volts and up to 80 amperes. The power source can be a simple selenium rectifier.

Electro-Mechanical Machining

Another new development is the electro-mechanical machining called Method X. In this process, electrical energy is used directly to effect metal removal without converting electrical to mechanical energy and using the force to propel the cutting edge through the work. Electrical forces are generated between the tool and work of sufficient magnitude to exceed the latter's tensile strength, and rupture occurs. The process is mechanical, not thermal (Fig. 1). The metal particles are detached from both work and tool without melting, leaving the surfaces produced free from physical or chemical changes. The tool, of the shape to be produced, is made the negative electrode and the work, the positive terminal. The required electrostatic forces are generated by the repeated charge and discharge of a parallel capacitor. The cutting action is submerged in a dielectric fluid (an insulating nonelectrolyte) which is usually a hydrocarbon. The spark discharge across the open gap or space between the electrode and work can then liberate hydrogen which de-ionizes the spark path, permitting frequent cycle repetition. The tool penetrates the work without physical contact. The feed or advance of the cutting electrode is automatically controlled to maintain as closely as possible the proper spark gap for the applied potential. This control prevents contact which might generate an arc. The dielectric fluid also serves to carry away the loosened particles from the work area.

The standard model machine resembles a jig borer in physical appearance (Fig. 2), and is of the vertical spindle knee and column type. The work holding table can be traversed longitudinally and transversely. The fluid receptacle is mounted on a 360-deg rotating base. The spindle carrying the electrode can be either revolved and advanced as for threading or boring, reaming, etc., or can be moved vertically without rotation as in the forming of other than round holes. The spindle is actuated by a lead screw driven through bevel gears and a reduction gear by an infinitely variable speed d-c motor. The associated tool and electrical equipment includes the necessary means for charging and controlling the cutting motions. The control and electrical systems are available separately for those users who wish to adapt the method to their own machines for such applications as broaching, cutting off, and surfacing.

Fig. 1. This machining process is mechanical. Chips leave the work and tool without melting.



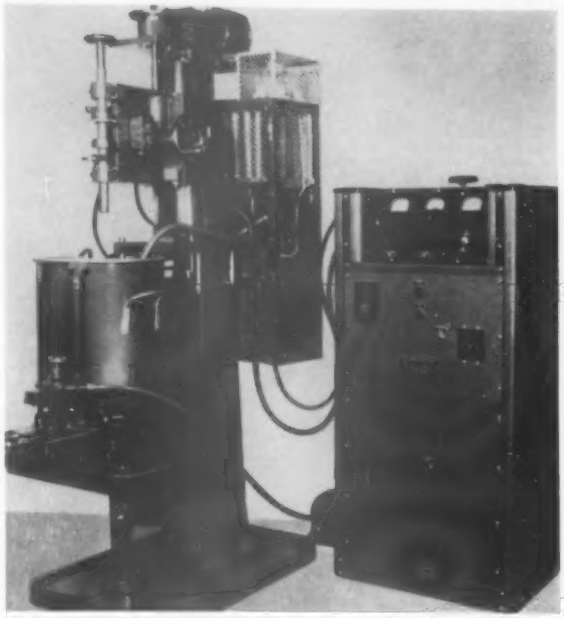


Fig. 2. The standard model machine for electro-mechanical machining resembles a jig borer in appearance.

Tapping and Threading. One of the unique applications, and possibly one of the most valuable, is that of tapping or threading. For many applications of sintered carbide involving heavy loads, high temperature, or impact, the conventional method of joining the carbide sections to the supporting steel shank or other supporting structure by means of brazing is entirely unsatisfactory. For the first time, there is now a convenient means of incorporating screw fastening devices (Fig. 3). The threading is done quite simply, using, whenever possible, a threaded hollow brass tube as the tool. Unlike conventional machine practice involving the use of a tap drill before inserting the tap, the work is performed in a single operation, leaving a core slightly smaller than the inside of the tube which can easily be broken off in case the hole is blind. In a blind hole, the last few threads will be imperfect or incomplete due to electrode erosion but since good mechanical design provides clearances at the bottom of such holes, no difficulties are encountered. In Class 2 threads, which are easily produced, the stud will ordinarily assemble into the threaded hole to within about $\frac{5}{8}$ of a turn of the bottom.

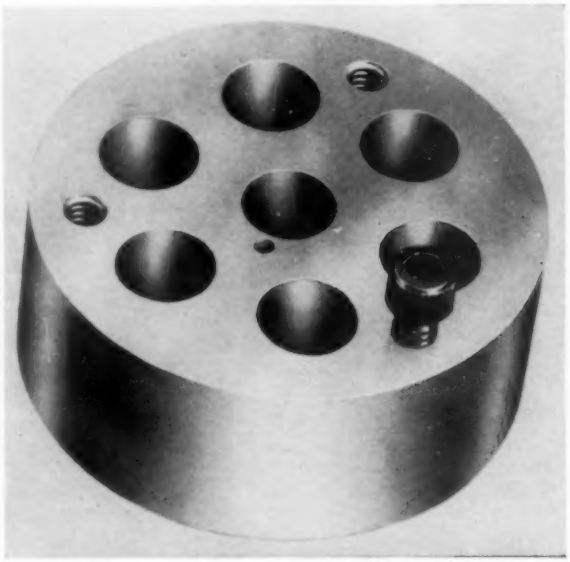


Fig. 3. Sintered carbide can be threaded conveniently for incorporating screw fasteners.

Shape Cutting. The method is ideally suited to the forming of both simple and intricate interiors, both blind and through holes (Fig. 4), and to exterior shaping as well. When round holes of ¼-in. diameter are to be made, the electrode is usually hollow and rotated. This confines the cutting action to the wall thickness of the tube and permits pressurized supply of the dielectric fluid through the tube tool to assist in clearing chips and greatly increases the speed of cutting. As a by-product, a core of the material cut slightly smaller than the inside of the tubing may be salvaged. Holes, from approximately 0.004-in. in diameter up to the largest brass tubing available, can be produced even in the hardest metals including sintered carbides of all types. Intricacy is of no consequence, inasmuch as any shape which can be produced in brass, which is cheap and easily formed, can be duplicated in any metal. Examples of intricate exterior shapes are the razor perforating punch and turbine bucket mounting serration.

Machining Accuracy. The size of the opening or shape produced is a direct function of the electrode dimensions and the applied voltage. If 50 volts are used to charge the condenser, the hole will be about 0.003 in. larger than the electrode and of the same shape. If 150 volts are used, the hole will be approximately 0.024 in. larger than the electrode. Accuracy of approximately plus or minus 0.0005 in. is regularly achieved. On finish cuts at low voltage, the surface quality can be as high as 26 micro-inches. The accuracy of spacing between centers of openings made through the same piece is limited only by the precision with which the table is moved and positioned by the cuts. There is no torque or thrust involved because there is no contact between the tool and work. This factor, which contributes so largely to inaccurate spacing of holes made by conventional methods, is non-existent in a Method X operation.

Production Rates and Costs. The original machine, built about two years ago, could cut tungsten carbide at the rate of about one inch per hour. Later models now in production cut at the rate of several inches per hour, and further improvements which might conceivably culminate in rates of several inches per minute are within the realm of possibility.

Some idea of current production rates may be had from the following examples. A ¼ in.-20 thread in carbide, including the making of the necessary electrodes, would cost $20 to $25 per hole. Hole location would be closer than 0.001 in. This price is subject to increase if the depth is more than twice

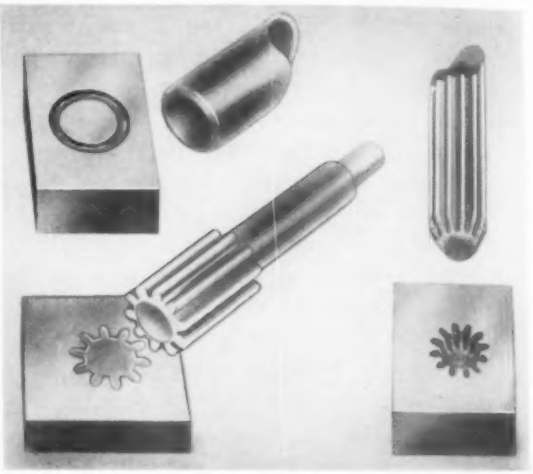
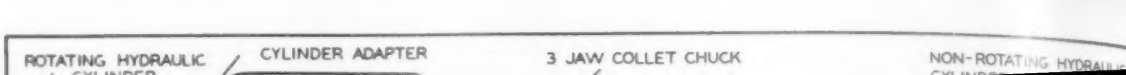


Fig. 4. Intricate interiors including both blind and through holes can be formed in the hardest metals.

the thread diameter. A 10/32-in. thread would be $12.50 per hole. A 5/16 in.-18 thread would be $25 to $30. A rough drilled and reamed ½-in. diameter hole would require about 3 hours for a 2½-in. depth and would be available at $30. A 5/16-in. diameter, ½-in. depth hole could be rough drilled in 13 minutes. A 2 by 1-in. section could be cut off in 30 to 40 minutes. In evaluating these rates, it must be remembered that the principal application of Method X is to metals which cannot be machined at all by conventional methods. However, the principle is capable of further development which may make it possible to compete, both time and costwise, with such operations as conventional drilling, boring, and reaming, and perhaps even broaching.

Current cutting rates are actually about only one percent of the theoretical values which can be derived from a mathematical analysis of the process, thus indicating the potential improvements that can be made by further development and refinement of the process.



Power Operated

Shell Chucking Equipment

By H. L. Stewart

LOGANSPORT MACHINE CO.

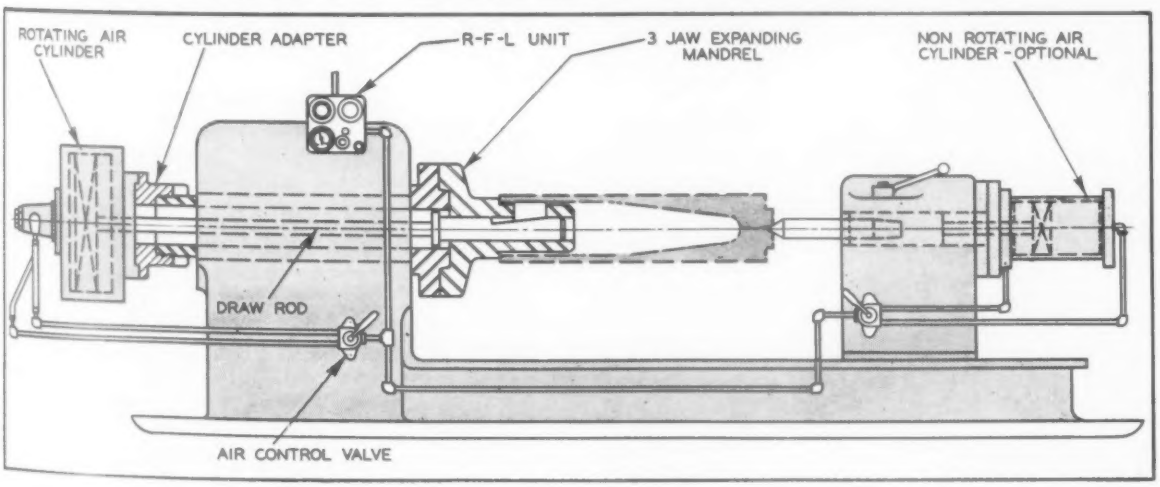
THE USE OF AIR and hydraulic power for actuating shell chucking devices has increased the production of artillery shells. Due to the high gripping power that air or hydraulic chucking devices afford, these mediums are highly satisfactory since shells must be gripped very tightly for the heavy stock removal by carbide or other high-speed tools. Plunge cuts with multiple tools are necessary to keep production at a maximum. Whether air or hydraulic power is used depends upon the machine and the operation. On a machine in which the spindle weight must be kept at a minimum, a small hydraulic cylinder is usually more desirable than a large air cylinder. Both would develop the same pressure but there would be considerable difference in weight. Hydraulic power for chucking naturally lends itself for machines in which the feeds and slides are controlled by non-rotating hydraulic cylinders.

The Chucking Circuit

Basically, the air chucking circuit consists of either a mandrel, a collet chuck or a universal type chuck, a rotating cylinder, a lubricator, filter and reducing valve unit, a non-rotating tailstock cylinder and operating valves. See Fig. 1.

The basic hydraulic chucking circuit consists of one of the holding devices mentioned above, a rotating hydraulic cylinder, an electric hydraulic power unit, either of the accumulator or continuous operating type, a tailstock cylinder and the operating valves. Hydraulic accumulators either spring-loaded or bag type, lend themselves readily to chucking circuits. They help reduce heat, wear and electric power consumption. Complex or automatic circuits contain the necessary fluid power components to control the feeds and slides which give a complete cycle without the operator touch-

Fig. 1. Air power for the chuck is provided as shown in the accompanying diagram.



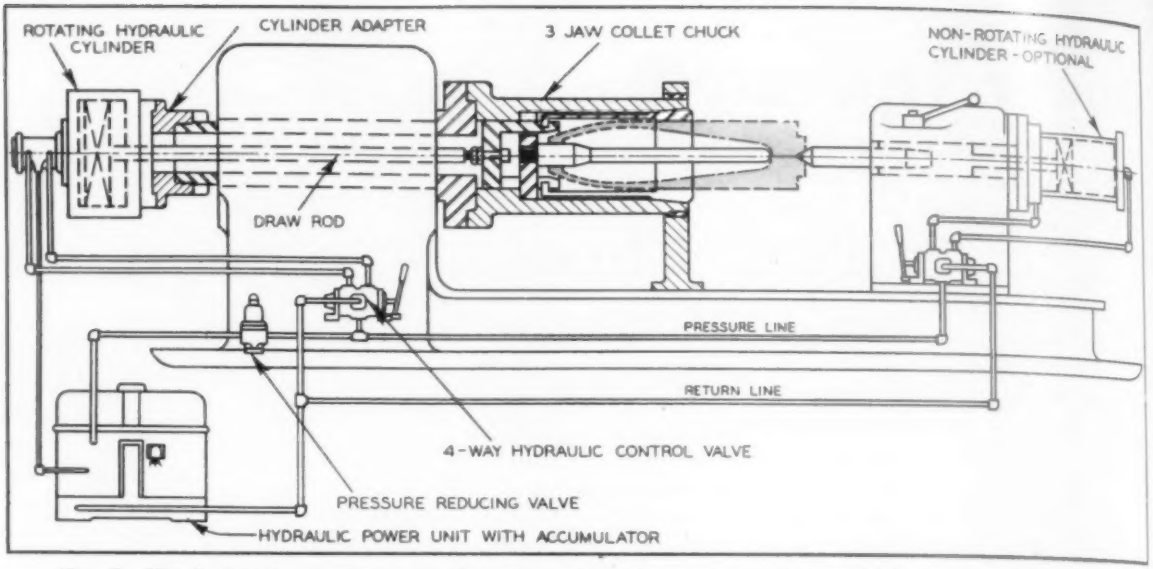
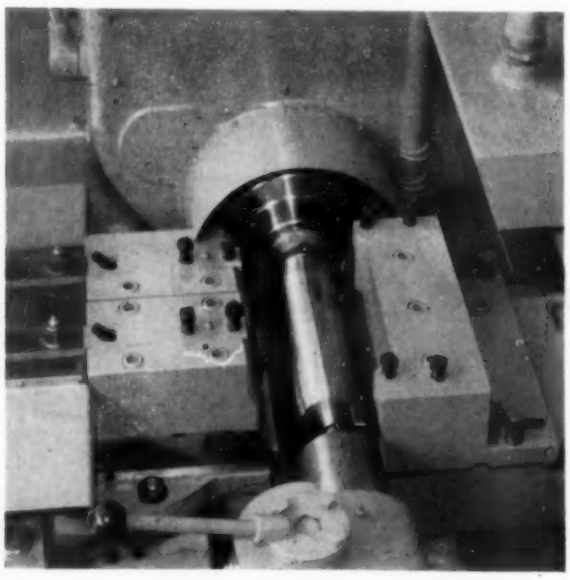


Fig. 2. The hydraulic power system shown here includes an accumulator which reduces heat, wear and electricity consumption.

ing the controls. This further increases production since one operator can operate two or more machines. See Fig. 2.

Whether the shell chucking device be a mandrel, a collect chuck, or a universal type chuck depends upon three factors: the type of lathe on which the shell is going to be machined, the operation to be performed, and the size of the shell. The well known shells such as 75 mm, 105 mm and 155 mm, as well as the 37 mm to 16 in., are held by the above devices during the machine operation. In two different plants machining identical shells, the sequence of machining operations may vary greatly, depending on the type of turning machines in each plant. This is especially true if one plant is using turret lathes or screw machines and the other is using special shell lathes. The design of each of the holding devices is dictated by the shape of the shell and the operation to be performed.

Fig. 3. Multiple tools are used here to semi-fin'sh turn, face, form and chamfer a 76 mm shell. Courtesy Lodge and Shipley Co.



Mandrels

Mandrels may be classified as centering, rough-turn and finish-turn types. Mandrels are used for the heavy stock removal operations. The centering mandrel shown in Fig. 4 holds the shell for the first machining operation which is the placing of the center in the nase of the shell and cutting off the open end of the forging. This mandrel is designed with six jaws, three equally spaced at two locations. The spring-loaded band design keeps the jaws from falling out of the mandrel when the shells are removed. All centering mandrels have adjustable work locators with hardened noses for properly locating the shell in regard to the tooling.

Some centering mandrels are built with the work locator as part of the mandrel as shown in Fig. 4 while others are built with the work locator as a loose fixture which is dropped into the shell before placing the shell on the mandrel. After the locator is properly set, a whole production run can usually

Fig. 4. The centering mandrel holds the shell for the first machining operation.

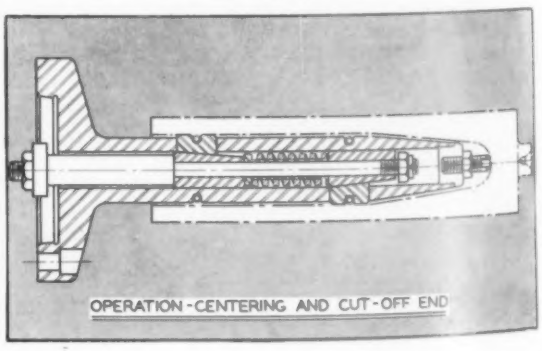


TABLE I—THEORETICAL CLAMPING PRESSURE OF POWER CHUCK

Chuck Size	Lever Ratio	Cylinder Size	Clamping Pressure at 80 psi
6	2 to 1	3 or 4½	1130 2544
8	2¼ to 1	6 or 8	5087 9047
10	3⅜ to 1 2⅜ to 1	6 or 8	5369 9549
12	2⅞ to 1	10 or 12	18063 26013
15		12 or 14	30537 41563
18	4 to 1	14 or 16	49260 64340
21	5 to 1	14 to 18	61575 101750
24	5 to 1	14 to 20	61575 125560

be machined without a resetting. The very shallow angle on the drawsleeve exerts high chucking pressure against the jaws. The mandrel shown here is of the push type construction where the draw bar is forced forward, pushing the jaws out against the workpiece. The rear jaws set first, then the front jaws are forced into place by the spring action against the floating drawsleeve. Centering mandrels are also made of the pull type construction.

Rough turn mandrels are constructed with three serrated jaws for maximum gripping pressure for the heavy roughing operation. The bodies of these mandrels are usually of heavy steel forging in order to withstand the heavy side thrust which is exerted by the cutting tools. Rough turn mandrels are usually of the pull type construction. Adjustable work locating fixtures are usually apart from the mandrel and are loaded into the shell before the shell is placed on the mandrel. Although the stroke of the drawsleeve is quite long, the jaw movement

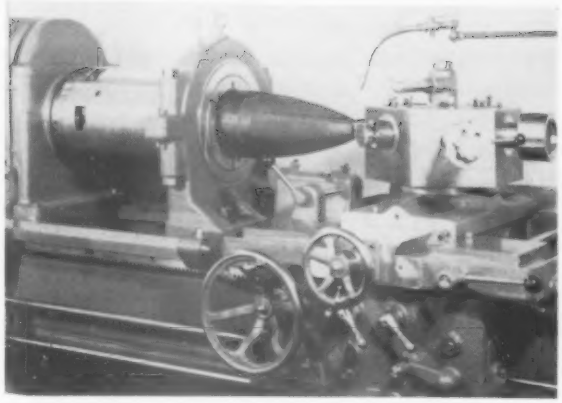


Fig. 6. A large air-operated collet chuck is gripping a 240 mm shell while the nosing operations are being performed. Courtesy of Sidney Machine Tool Co.

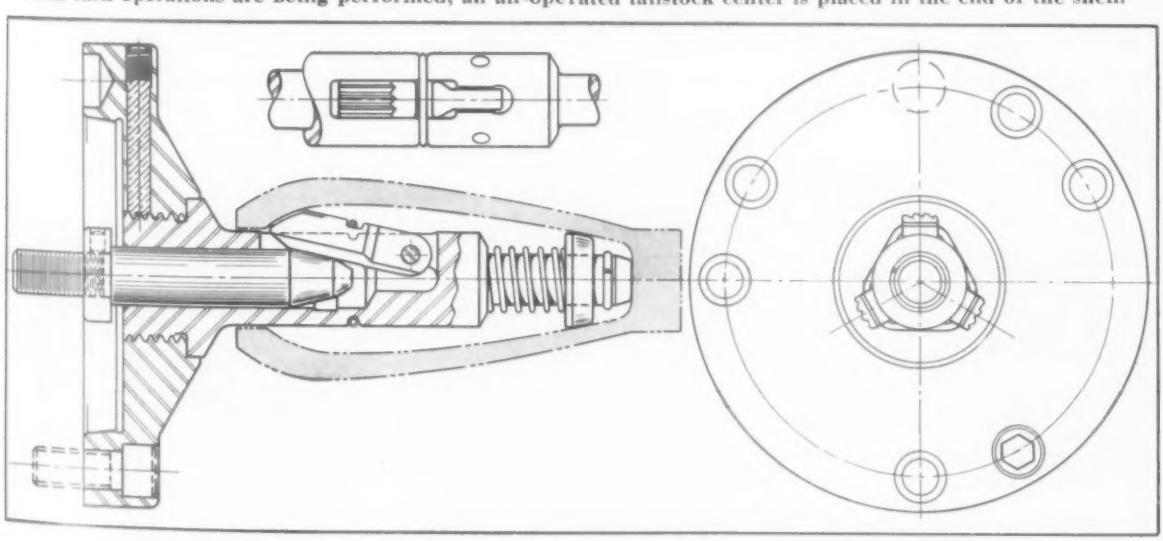
is very short, due to the shallow angle on the drawsleeve.

The rough turn type mandrel is also used for the semi-finish turn, face, form, and chamfering operations. Stock removal of ⅛ in. on a side is accomplished by the use of cemented carbide cutting tools. With multiple tools, a 76 mm shell can be machined in 0.76 minutes with a floor to floor time of 1.16 minutes. The shell is supported on the base during the above operations by the center on an air-operated tailstock.

The finished turn mandrels are designed so that the jaws grip in the fuse recess of the shell. The nose of the shell butts up against a hardened work stop directly behind the serrated jaws. These mandrels are of three-jaw construction and are of either the push or pull type, depending upon the size of the shell. Shells with very small fuse recess will be of the push type in order to assure ample strength at the gripping points.

With the finish turn mandrel, the finish taper turn, finish turn, and finish form turn operations are

Fig. 5. To support the closed end or base of the shell while the finish taper turn, finish turn and finish form turn operations are being performed, an air-operated tailstock center is placed in the end of the shell.



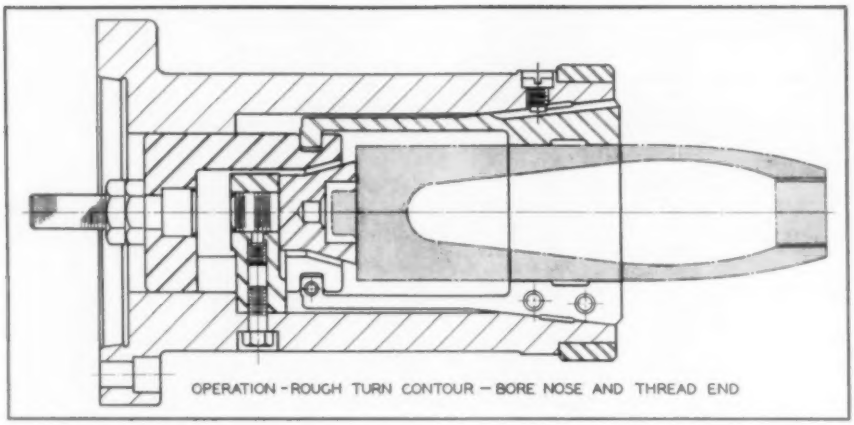


Fig. 7. For the operations on the nose end of the shell, the shell is placed in the collet against a hardened work locator which is attached to a spider designed to receive various kinds of locators.

completed. To support the closed end or base of the shell during these operations, an air-operated tailstock center is placed in the end of the shell for support. For shells which have a small nose but a large internal cavity as shown in Fig. 5, it is necessary to design a mandrel which is not along the conventional lines. Note the swing-type jaws which swing out against the sides of the shell when the tapered drawbar engages the bottom of the jaws. The spring-loaded work locator centers the shell on the closed end as well as furnishes a stop. The garter spring around the jaws depresses them when the drawbar is retracted.

In nearly all cases collet chucks are used for the final operations on the shells. Again, this depends to a great degree upon the type of machine upon which they are placed. Collet chucks could probably be placed in two categories, one for nose operations and one for base operations.

Since it is necessary that the shell be supported fairly close to the center, collet chucks become quite large and bulky as the size of the shells increases. For large shells it is usually necessary to build a steady rest on the end of the chuck in order to relieve excess weight on the spindle bearings and also to reduce side thrust from the multiple cutting tools. Steadyrests are usually equipped with needle bearings or ball bearings for smooth operation. The base of the steadyrest is anchored to the ways of the machine and must be accurately located so that the center line of the steadyrest is in line with center line of the spindle.

The body of the collet chuck is usually of a close grain, high-tensile cast iron with the wearing surfaces being flame hardened. The master collet is usually split into three segments and is made of a good alloy steel which must have good bearing qualities when it bears against the body and the drawsleeve, and must be strong enough so that there is no chance for a break in the necessarily thin section.

Some master collets, especially for very long shells, are designed with tie rods running from the gripping surface back to the hinged section at the drawsleeve. This eliminates some of the expensive machining operations as well as reduces cost of material. Master collets are keyed in order to eliminate turning in the body. Heavy springs keep the master collet out against the body when the drawbar is in the forward position. The drawsleeve is made of an alloy steel and must withstand the shearing and compression forces, especially at the thin section where the master collet is hinged.

For the operations on the nose end of the shell, the shell is placed in the collet against a hardened work locator as shown in Fig. 7. The work locator is attached to a spider which is designed to receive various types of locators, depending on the operation. In order to provide access to the drawstud, work locators must be designed so that they can be easily removed. Depending upon the type of turn-

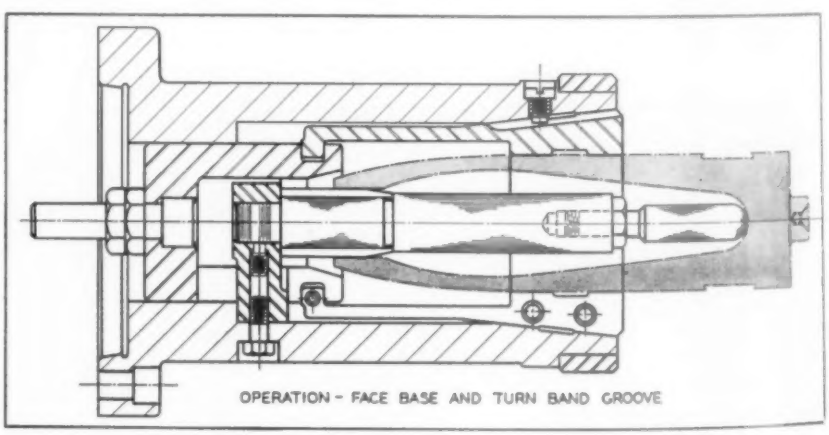


Fig. 8. For the operations on the base of the shell, the shell is located against the end of an adjustable male locator and the fuse recess is piloted on a hardened tapered bushing.

ing equipment, this collet may be used for boring the nose, rough turning, contour and threading the nose. In many instances the threading operation is done on a tapping machine.

For the base operations the shell is placed in the collet chuck as shown in Fig. 8. The shell is located against the end of an adjustable male locator and the fuse recess is piloted on a hardened tapered bushing. This chuck is employed to face the hub from the base and to turn the band groove. This same chuck can also be used to finish the band after it has been assembled to the shell. Collet chucks similar in design to those in Fig. 8 but with different type work locators are used for gripping armor piercing shot. This shot is usually located in a nesting type locator which gives added support.

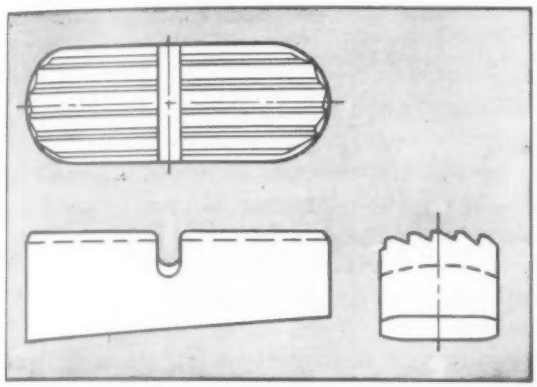


Fig. 9. The mandrel jaws shown here are compact in design and have saw-tooth type serrations with the narrow lands running parallel to the centerline of the mandrel.

Universal Type Chucks

Large universal type three-jaw power-operated chucks have been used very successfully for holding large shells during the band grooving, band waving, and nose boring operations. The chucks are equipped with special false jaws to fit the contours of the shells.

Jaw Design. The design of the jaws is very important to the success of each operation. One of the most common errors in jaw design is to use too much gripping surface. Material for jaws must be of a good alloy steel that can be satisfactorily hardened on the surface to a Rockwell of 58 to 60 C, yet still have a very tough interior. These jaws must withstand high compressive loads as the drawsleeve or collet is moved and the jaws are forced out and dig into the rough shell forging. A heavy shearing action takes place in the jaws when the tools bite into the shell, actually trying to shear the serrations from the jaws.

Mandrel jaws are very compact in design. See Fig. 9. Note the saw-tooth type serrations with the narrow lands running parallel to the center line of the mandrel. The lands are ground in the gripping position after the jaws are placed in the mandrel body, thus assuring perfect concentricity. Very close tolerance is held between the jaws and body to reduce possibility of side thrust and end play. On some installations it is necessary to reduce the number of jaw serrations in order to increase the gripping pressure. Some mandrel jaws for large shells are designed with inserts which are cemented or brazed into place. These inserts can be replaced after they wear or chip without replacing the entire jaw.

Collet jaws may be designed as small pads which are fastened to the master collet with screws or may be designed as a part of the master collet. Since it is often necessary to replace jaws on high production runs, it is more economical to make them as separate pads. Sometimes, because of space requirements, they must be made as part of the master collet. By using separate pads, several sizes of shells may be gripped in one collet chuck by merely increasing or decreasing the thickness of the jaw pads. Depending on the pressure angle, jaw movement is very small in regard to the movement of the drawsleeve. For example, a 29/32-in. drawbar movement gives only 0.022 in. between the maximum and minimum gripping diameters.

Jaws may be either smooth or have square serrations, depending largely on the operation. Final grind on the jaws may be done in the gripping position after the collet chuck has been placed on the machine spindle. This assures perfect concentricity with the spindle.

TABLE II—THEORETICAL GRIPPING PRESSURES OF MANDRELS AND COLLET CHUCKS USING AIR CYLINDER GRIPPING PRESSURE*

Cyl. Size	Cyl. Force 80%		Cyl. Force 100%		With 3° Taper on D. S.				With 4½° Taper on D. S.				With 7½° Taper on D. S.			
					80%		100%		80%		100%		80%		100%	
	Push	Pull	Push	Pull	Push	Pull	Push	Pull	Push	Pull	Push	Pull	Push	Pull	Push	Pull
3	565	502	706	627	16950	15060	21180	18810	11300	10040	14120	12540	6780	6024	8472	7524
4½	1272	1209	1509	1430	38160	36270	45270	42900	25440	24180	30180	28600	15264	14508	18108	17160
6	2261	2163	2827	2704	67830	64890	84810	81120	45220	43260	56540	54080	27132	25956	33924	32448
8	4021	3923	5026	4903	120630	117690	150780	147090	80420	78460	100520	98060	48252	47076	60312	58836
10	6283	6142	7854	7677	188490	184260	235620	230310	125660	122840	157080	153540	75396	73704	94248	92124
12	9048	8907	11310	11133	271440	267210	339300	333990	180960	178140	226200	222660	108576	106884	135720	133596
14	12315	12174	15394	14217	369450	365320	461820	426510	246300	243480	307880	284340	147780	146088	184728	170604

*These pressures do not take into consideration any friction.

Basic Forming Techniques for the Copper Base Alloys

By Lester F. Spencer
CHIEF METALLURGIST
LANDERS, FRARY AND CLARK

Part I

BOTH COPPER and those copper base alloys having a single phase structure, usually identified as the 'alpha' type alloys, are best known for their ability to withstand a great deal of cold working such as in operations involving deep drawing, spinning, cold heading, etc. The degree of cold working that can be performed on any composition is limited; an increase in both hardness and mechanical properties accompanied by a decrease in ductility values is realized. Fortunately, this cold worked condition can be rectified by the use of an anneal which restores, to a large extent, the original ductility of the fabricated part. Thus, the judicial choice of operations involving both cold forming and regenerative anneals makes possible the production of complex shapes.

Copper employed in cold working operations is usually supplied in the annealed condition; a grain size varying from 0.015 to 0.030 mm is usually specified. However, this particular factor may vary in accordance to the specific type of cold work operation. In many instances, in the manufacturing of certain types of products, it is common to obtain reductions as high as 90 percent without intermediate annealing. Until recently, the copper used for deep drawing and pressing has been mostly of the tough-pitch variety, but deoxidized copper sheet or phosphorized copper can be re-drawn indefinitely without annealing if the reductions in diameter are held to a minimum and the fabricated article is a simple straight-sided shell. However, if the diameter is appreciably reduced, a sleeve is required to prevent folding or tearing with the result that the extent of re-drawing without annealing is limited.

The most common alloy for press drawing is yellow brass and the amount of redrawing that can be performed without annealing is governed by the rate of work-hardening under deformation. The 'alpha' brasses containing in excess of 85 percent copper have work-hardening properties very similar to that exhibited by copper. Those alloys containing a copper content between 64 and 85 percent will work-harden more readily with the result that less reductions can be realized before an anneal is required.

Gilding metal, commercial bronze and red brass are used extensively for fabricated items; the first two alloys have favorable color characteristics and are used on articles to be subsequently plated or finished in their natural color, whereas red brass is well known for its excellent corrosion resistance.

Low brass has cold working properties similar to those exhibited by red brass, but under certain conditions, dezincification and season cracking may result. Cartridge brass has excellent cold working properties, but control of impurities must be rigid. Thus, iron, due to its hardening action, and lead, because of its influence on fire cracking, are usually limited to 0.05 percent maximum. This effect due to lead is said to be of very rare occurrence. Such impurities as phosphorous, antimony, nickel, chromium and aluminum are usually kept to a trace or less.

The nickel silver alloys are usually chosen for their favorable color characteristics. The relationship between the alloy content and color is indicated in Fig. 1. The single-phase nickel-silver alloys are more frequently used where plating is the finishing operation. These alloys are very sensitive to impurities and both lead and tin will reduce the ductility of the alloy composition. The effect of tin is accentuated by traces of antimony within the analysis. Both iron and manganese will increase the rate at which the metal will work-harden. In deep drawing, it has been suggested that a high zinc

content nickel-silver alloy be avoided since it is generally accepted that this element increases the rate of work-hardening, increases the tendency of 'fouling' the tools during drawing, and may induce an undesirable large grain size during annealing

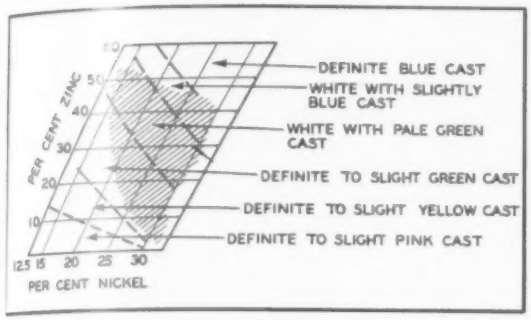


Fig. 1. Color trends of copper-nickel-zinc alloys. The shaded areas indicate sensibly 'white' alloys. (T. E. Killgren, "Properties of Wrought Nickel Silvers," *Metals Handbook*, 1939. American Society for Metals.)

procedures. It has been stated that an 18-percent zinc content is the maximum desirable.

The harder and more refractory alloys such as the phosphor bronze and silicon bronze compositions are not widely used for press drawing, but they can be drawn to some extent, particularly if attention is given in the elimination of the abrasive tin and silicon oxides, if bright annealing procedures are employed, and where proper lubrication can reduce metal-to-metal friction. The Grade B silicon bronze (1.25/2.0 silicon) is usually selected where an alloy such as this is required for press drawing. All types of copper silicon alloys can be cold headed. This particular group of alloys is preferred due to both its resistance to stress corrosion cracking and to corrosion. In the cold heading of these bronzes, it is best to facilitate the flow of metal into the head and reduce the possibility of stress concentrations by incorporating a small fillet under the head. A fillet of $\frac{1}{32}$ in. minimum is used for bolts up to $\frac{5}{16}$ in. in diameter; a fillet of $\frac{1}{16}$ in. minimum is used for larger diameter bolts. Other alloys such as high brass, commercial bronze, low brass, red brass and naval brass are also used as cold heading material. Some of the low leaded brass compositions containing from 0.3 to 0.75 percent lead can be used where a combination of cold heading and machining operations are required.

The primary purpose of a specification is to insure the fabricator that a specific part can be successfully produced with a minimum of difficulty, or to establish certain properties within the item after completion of the part. The written specification may include such items as chemical composition, mechanical or physical properties, dimensional

TABLE I—ENGINEERING ALLOYS FOR DRAWING, SPINNING, STAMPING

		High Brass	70 - 30 Brass	Low Brass	Red Brass	Commercial Bronze	Gilding Metal	Copper Elec T P	Phosphor Bronze TypeA	Phosphor Bronze TypeC	Phosphor Bronze TypeE2	Nickel Silver 18 pct.	Silicon Bronze I	Silicon Bronze II	Silicon Bronze V
Chemical Analysis, Percent															
Copper		66.0	70.0	80.0	85.0	90.0	95.0	99.92m	94.35	91.9	98.7	65.0	97.6	97.0	98.0
Tin		—	—	—	—	—	—	—	5.5	8.0	1.25	—	1.4	—	—
Zinc		34.0	30.0	20.0	15.0	10.0	5.0	—	—	—	—	17.0	—	—	—
Oxygen		—	—	—	—	—	—	0.04	—	—	—	—	—	—	—
Silicon		—	—	—	—	—	—	—	—	—	—	—	1.0	3.0	2.0
Phosphorous		—	—	—	—	—	—	—	0.15	0.1	0.05	—	—	—	—
Nickel		—	—	—	—	—	—	—	—	—	—	18.0	—	—	—
Mechanical Properties															
Tensile Strength, psi	Hard*	74,000	76,000	74,000	70,000	61,000	56,000	50,000	81,000	93,000	65,000	85,000	78,000	94,000	78,000
	Soft	47,000	47,000	44,000	40,000	38,000	35,000	34,000	50,000	60,000	40,000	60,000	45,000	60,000	45,000
Yield Strength, psi (½ percent extension under load)	Hard*	60,000	63,000	59,000	57,000	54,000	50,000	45,000	75,000	72,000	50,000	75,000	50,000	58,000	50,000
	Soft	15,000	15,000	14,000	12,000	12,000	11,000	11,000	21,000	24,000	14,000	30,000	15,000	25,000	15,000
Elongation, percent in 2 in.	Hard*	8	8	7	5	5	5	4	10	10	8	3	5	8	5
	Soft	62	62	50	47	45	45	45	52	63	48	35	45	60	45
Rockwell Hardness	Hard*	B80	B82	B82	B77	B70	B64	B50	B87	B93	B75	B87	B80	B93	B80
	Soft	F64	F64	F61	F60	F57	F52	F45	F77	F82	F60	F90	F70	F85	F70
Fabrication Properties															
Machinability Rating**		30	30	30	30	20	20	20	20	20	20	20	30	30	30
Cold Working		Excel.	Excel.	Excel.	Excel.	Excel.	Excel.	Excel.	Excel.	Good	Excel.	Excel.	Excel.	Excel.	Excel.
Hot Working		Poor	Poor	Fair	Good	Good	Good	Excel.	Poor	Poor	Excel.	Poor	Excel.	Excel.	Excel.
Hot Working Range, deg F		—	—	1500/ 1650	1450/ 1650	1400/ 1500	1400/ 1600	1400/ 1600	—	—	1500/ 1600	—	1300/ 1600	1350/ 1550	1300/ 1600
Physical Constants															
Melting Point (Liq) deg F		1710	1750	1830	1880	1910	1950	1981	1920	1880	1970	2030	1940	1880	1940
Density, lb/cu in		.306	.308	.313	.316	.318	.320	.321/ .323	.320	.318	.321	.316	.317	.308	.316
Coeff. Therm. Exp. per deg F from 77 deg F to 572 deg F x10^{-6}		11.3	11.1	10.6	10.4	10.2	10.0	9.8	9.9	10.1	9.9	9.0	9.3	9.3	9.8
Therm. Cond. Btu/sq ft/ft/hr /deg F at 68 deg F		67	70	81	92	109	135	226	47	36	120	19	35	21	27
Elec. Cond. percent IACS at 68 deg F soft		27	28	32	37	44	56	101	18	13	43	6	13	7	9
Mod. of Elas. (tension) psi x10^6		15	16	16	17	17	17	17	16	16	17	18	17	15	17

*Hard temper values are for strip reduced 4 B&S gage numbers in thickness by cold rolling.
**Machinability rating on basis of Free Cutting Brass as 100 percent
Note: All figures are nominal values and should not be used as specifications

Data obtained from Bridgeport Brass Technical Handbook

tolerances, grain size limitations in the 'as received' condition and/or possibly, freedom from either internal or external flaws which may hinder successful fabrication of the part. In some cases, reference is made to existing specifications such as promulgated by ASTM or agencies of the Government. However, it is more common to specify that the producer supply a material which consistently provides successful fabrication of a specific part in accordance with either an operational sequence as listed, or in accordance with a blueprint of the completed part. This latter type of specification places the burden on the producer and any other kind of specification as a supplement is superfluous.

A fabricator would consider uniformity of gage as one of the most desirable properties of sheet metal or strip; usually the smaller the variation in gage, the more readily a difficult part can be formed by a given set of tools and press conditions. In this regard, an economic balance must be maintained between that desired and that commercially available, and in many instances, the fabricator should realize the limitations of producing dimensionally accurate sheet or strip. The presence of internal defects such as inclusions should be at a minimum, especially where severe forming operations are encountered. Fortunately, this type of defect does not occur too frequently in the copper industry. More frequent are surface blemishes such as cold laps, laminations, spills or gas bubbles, etc. Gross imperfections are mill-rejected, but there are instances where these defects are masked due to the burnishing action of the rolls. Thus, as a result, these hidden blemishes become visible only after cold working operations are performed, which places the metal under tensional stresses. Surface blemishes usually in the form of spills may prove quite troublesome due to the increased polishing time necessary to minimize or eliminate this defect. This is particularly true when the article is to be plated.

Usually a fine grained material is desired for metal that is to be cold worked severely; a coarse grained material obtained either from the mill or resulting from improper annealing procedures will produce the characteristic orange peel effect illustrated in Fig. 2. Where the article is to be plated or polished to a high luster, the cost of removing this orange peel may be excessive and, even then, complete removal may not be effected. The grain size selected is in accordance with the type of cold work operation, the extent of this cold

Fig. 2. A fine grain structure as shown at the bottom is desirable when the alloy is to be cold worked. The coarse grain structure shown at the top results in an 'orange peel' effect. Mag. x 75.

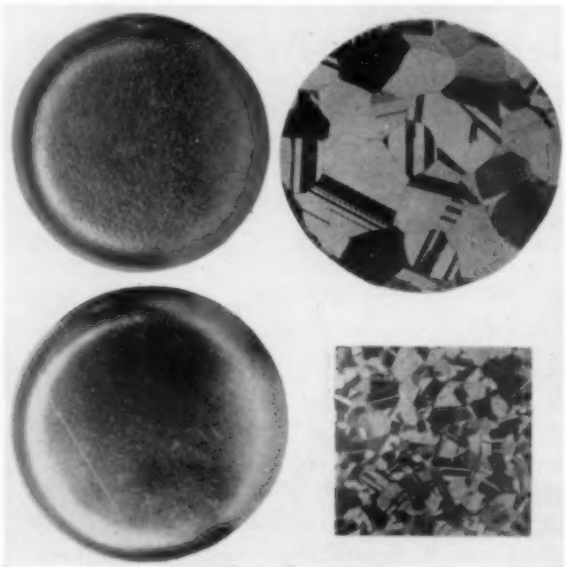


TABLE II—RECOMMENDED RADII FOR FORMING 90-DEG BENDS IN BRASS SHEET. (Cu - 64.5 67.5 percent; Pb - 0.30 percent max; Fe - 0.05 percent max; balance zinc.)*

Tempers B&S Numbers Hard	Gage	Bend		
		90 deg to Rolling Dir.	45 deg to Rolling Dir.	Parallel to Rolling Dir.
No. 2	0.005 to 0.0907	Sharp	Sharp	Sharp
No. 3	0.005 to 0.043	Sharp	Sharp	Sharp
	0.0508	Sharp	Sharp	1/64
	0.0571	Sharp	Sharp	1/64
	0.0641	1/64	1/64	1/32
	0.0808	1/64	1/32	3/32
	0.0907	1/64	1/32	3/32
No. 4	0.005 to 0.0253	Sharp	Sharp	Sharp
	0.0320	Sharp	Sharp	1/64
	0.0403	Sharp	Sharp	1/32
	0.0453	Sharp	1/64	1/16
	0.0508	Sharp	1/64	3/32
	0.0571	1/64	1/32	3/32
	0.0641	1/32	1/32	3/32
	0.0808	1/32	1/16	3/32
	0.0907	3/32	1/8	1/4
	0.1019	1/4	1/4	1/4
	0.1144	1/4	1/4	1/4
No. 6	0.0201	1/64	1/32	3/32
	0.0320	1/32	1/16	3/16
	0.0359	3/64	3/32	3/16
	0.0403	3/64	1/8	3/16
	0.0453	1/16	1/8	3/16
	0.0508	1/16	1/8	3/16
	0.0571	3/32	5/32	1/4
	0.0641	1/8	5/32	3/8
	0.0720	1/8	1/4	3/8
	0.0907	1/4	3/8	1/2
No. 8	0.0089	Sharp	1/64	3/32
	0.0100	Sharp	1/64	3/32
	0.0159	1/64	1/16	5/32
	0.0201	1/32	3/32	7/32
	0.0253	1/32	5/32	1/4
	0.0320	1/32	5/32	1/4
	0.0403	3/64	7/32	1/4
	0.0508	3/32	7/32	1/4
	0.0641	1/8	1/4	1/4
No. 10	0.0253	3/64	5/32	1/4

*Gohn, G. R. The Forming Properties of Some Non-Ferrous Metals, *Proc. A.S.T.M. Vol. 36, Part II*, pp 207-221, 1936.

work and the gage of the metal to be worked. In many instances, it is best to seek the advice of the producer of the raw material and his wide experience will undoubtedly prove advantageous in the selection. It must be remembered that where a fine grain size is obtained from the mill, the advantages obtained are lost where an intermediate annealing procedure within the fabricator's plant is such that unrestricted grain growth occurs.

Preferred orientation, often termed directional properties, can also prove to be quite troublesome. Evidence of this phenomenon is often found in subsequent drawing operations by the presence of 'ears' about the periphery. The height of these ears indicates to some extent the degree of directional properties within the drawn metal. This earing is objectionable in that it not only increases the trimming scrap, but also may cause breakage of the part. Where a high finish is desired on the completed part, excessive polishing may also be necessary, especially where slivers of metal have broken off from the ears in an initial draw and embedded themselves in the metal on a subsequent draw.

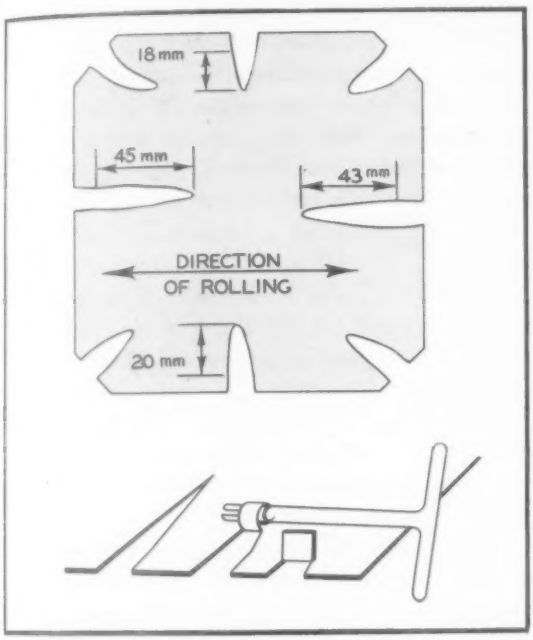


Fig. 3. The results of tear-length tests made in different directions on a 64-36 brass sheet show the directionality present in the sheet. The tests are performed as shown in the sketch.

The use of a tensile test both across and against the direction of rolling is in considerable usage in determining directional properties, but with the copper alloys the values obtained on annealed strip or sheet indicate but a slight difference. On the other hand, cold rolled material which has not been subjected to a final annealing procedure will have values which would reveal any pronounced directionality. The tear length test as indicated in Figs. 3 and 4 can also be used. This test consists of

Fig. 4. A straight-sided shell made of 18 percent nickel silver exhibits fire cracking which resulted from unequal stress distribution.

cutting slots at various sections of the sheet to be tested, forming short tabs. These tabs are gripped and a pulling force is applied until a triangular-shaped tongue separates from the sheet. Variations in the length of these tongues in various positions of the plate will indicate the presence and degree of directionality.

In many instances, temper designations on flat rolled products must be made on the basis of hardness values obtained by cold rolling. The values based on thickness and percentage reduction are expressed in Brown & Sharpe gage numbers. For example, in the B&S gage system, the gages are reduced by 50 percent every six numbers. Thus a No. 2 B&S is 0.02576; a No. 8 B&S is 0.1285; and a No. 14 B&S is 0.06408 inches. The following standards for hard rolled flat products have been traditionally followed by the brass industry.

TABLE III—STANDARDS FOR HARD ROLLED FLAT BRASS.

Temper	Rolled B&S Numbers	Reduction in Thickness
Quarter-Hard	1 B&S numbers hard	10.95%
Half-Hard	2 B&S numbers hard	20.70%
Three-Quarters Hard	3 B&S numbers hard	29.40%
Hard	4 B&S numbers hard	37.10%
Extra Hard	6 B&S numbers hard	50.15%
Spring	9 B&S numbers hard	68.65%
Extra Spring	10 B&S numbers hard	68.65%

Similarly, the temper of drawn wire is also based on the difference of cross sectional area and is expressed in both B&S numbers and percentage reduction figures. The trade also uses other designations such as 'rivet temper' which is usually between 8 and 20 percent reduction; and, 'machine screw temper' which is usually between 15 and 37 percent reduction. However in the manufacture of products where these special tempers may be applicable, it is advisable first to investigate the various standard tempers available before deciding upon the proper wire.

(Continued next month)

Relation of the Tool Engineer to Company Standards

By John Gaillard
MECHANICAL ENGINEER
AMERICAN STANDARDS ASSOCIATION

IN THE MODERN manufacturing organization the functions of the product designer and the tool engineer have been split between different groups of specialists. This does not mean that these groups can go about their jobs independently. The product designer should specify only what can be achieved, technically and economically, with the manufacturing facilities. One of the most striking sources of trouble on this score is the specification of manufacturing tolerances. Those in charge of designing the product and not directly concerned with problems of manufacture often have a tendency to specify tolerances for the dimensioning of component parts that are smaller than necessary. To begin with, the chance of more parts rejected and higher manufacturing cost increases as tolerances become closer.

But definite trouble arises when the product designer specifies manufacturing tolerances that cannot be maintained in regular shop practice. The relations between the engineering, manufacturing, and inspection departments may then become quite strained. The engineering department will claim that the specified tolerances must be maintained if the product is to function correctly. Therefore, no concessions can be made. The manufacturing department replies that the specified tolerances are impractical. Moreover, it complains that while the manufacturing department is being pressed for "getting out production," the inspection department, abiding by the specifications of the engineering department, rejects a large percentage of the shop's production. Caught between two fires, the manufacturing department may even try to mollify the strictness of the inspection department so that it will pass some product that is outside specified limits. If the engineering department learns of this, another storm is brewing.

The remedy for this situation is so simple that it may seem surprising. However, anybody who has dealt with industrial standardization work for some time will come to the conclusion that many a thing that at first appears to be simple, harbors many hidden problems which come to light only when trying to reach an agreement between various parties.

Therefore, sound standardization work should always begin by stating the problem, that is, standard terms and definitions. Several years ago the Swiss national standards body asked the ASA the simple question: "When is a single-point cutting tool considered as 'right-hand' or 'left-hand,' in the United States?" In the absence of any American standard on this subject, the ASA made a canvass. It looked like a simple question to be put before tool engineers. Surprisingly, the replies from half a dozen experts were divided about fifty-fifty, depending on the branch of industry and on geographical location. What some people called a right-hand tool was a left-hand tool to others.

There is now an American standard which says that: "A right-cut single-point tool is one which, when viewed from the point end of the tool, with the face up, has the cutting edge on the right side," and gives a similar definition for a left-cut tool. But these definitions and others applying to cutting tools, such as for clearance and relief, have been debated for several years in one of the ASA committees before they were settled. This is just to show that simple things not always are so simple, a statement which is true even for widely used basic units about which there would appear to be no doubt.

In 1932 Carl Edward Johansson, whose gage blocks have come to be known the world over, called on the ASA to ask, on behalf of the Ford Motor Company, that for industrial purposes the ratio between the inch and the millimeter be fixed as an American Standard at the value, 25.4. Why? The American and the British inch are, by legal definition in their respective countries, slightly different from each other and also from the length of 25.4 millimeters. The American inch is larger than 25.4 mm by about two parts in a million and the British inch is smaller than 25.4 mm by about 0.8 of one part in a million. At first sight, these appear

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to be trifling matters. What is a difference of two parts in a million? Visualize an inch on an enlarged scale and represent it by the height of the Empire State Building in New York, which is 1250 feet. Then assume that a dime is placed flat on top of the building. This adds two parts in a million to its height.

Nobody was bothered by such differences so long as they did not affect our industrial measurements of length and gaging practice. Even in cases where components are held within tolerances of a few ten-thousandths of an inch, the difference between the American inch, the British inch, and the value, 25.4 mm, has no effect on the acceptance of product made in quantity. However, when gages and measuring devices are checked with blocks held within a few millionths of an inch from their basic sizes, the use of different inch-millimeter ratios will give inconsistent answers. In 1933, as a result of Mr. Johansson's request, the ASA, supported by a consensus of American industry, approved the industrial inch-millimeter ratio, 25.4. Since British industry also had adopted this value, it became a world standard.

In passing, it may be observed that international agreement has been reached also on the reference temperature of 68 F or 20 C for gages and industrial length measuring instruments. Formerly, three different reference temperatures were used. The United States and the European continent, except France, used 68 F (or 20C), a comfortable workshop temperature. The British used 62 F (or 16 2/3 C) because this is the reference temperature of the British imperial yard. And the French had adopted 32 F (or zero C) because this is the reference temperature of the international prototype meter. In those days a gage manufacturer did not know how to dimension a gage before he knew in what country it was going to be used. For the sake of world uniformity, the British and French have compromised on 68 F for industrial practice.

Both agreements, the unification of the inch-millimeter ratio and the unification of the reference temperature, were reached by the procedure of the International Standards Association (ISA) which was succeeded after World War II by the International Organization for Standardization (ISO), a federation of national standards bodies on which the American Standards Association represents the United States.

Coming back now to the basic problem of having the product designer and the tool engineer see eye to eye, distinguishing between specification tolerances and shop tolerances is of primary importance. Specification tolerances are those placed on the drawing by the product designer with a view to proper assembly of the components and sound performance of the complete unit in operation. Shop tolerances are the closest tolerances that the shop can maintain in regular manufacturing practice.

Basically there are two possibilities. If the specification tolerances are larger than the shop tolerances, there is no problem in making the parts with the accuracy indicated by the product designer. Also, the components can be assembled by picking them at random from their respective lots or production flows. That is, they are completely interchangeable.

If on the contrary, the shop tolerances are larger than the specification tolerances, satisfactory assembly can be attained only by selective fitting. Components must be sorted to different zones of their shop tolerances, and only parts belonging to corresponding zones may be assembled for correct fits.

Selective assembly complicates matters. It requires sorting of the parts and keeping them sorted. The chances are that some of the selected components cannot be matched by counterparts. Furthermore, selective assembly may affect the design of the product. The reason may be that it is impractical to apply selective fitting in servicing equipment in the field. A complete unit, assembled by selective fitting, must then be supplied by the factory when replacement is needed. Therefore, the unit must be designed as a detachable one.

Selective fitting must be applied if the shop tolerances exceed the specification tolerances. It may be applied, as a matter of preference, where it is more economical than working to the closer, but practicable, tolerances required for interchangeable assembly. If there is a choice between two possibilities, the decision as to which method is to be adopted as standard in a particular case should be made on the advice of the tool engineer, who is the expert in manufacturing methods.

Tolerance Problems Simplified

Decisions on tolerance problems may now be reached much more easily than, say, ten years ago. There is now a definite method of determining whether production equipment will be capable of maintaining given tolerances. In the past this was a matter of judgment on the part of the tool engineer, based on his experience. Although recognizing him as an expert, the product designer, using his own judgment, might not really be satisfied that the shop could not work to certain specified tolerances.

A criterion for answering the question of what maximum accuracy is attainable is supplied by the quality control chart, a device based on the theory of probability, but simple in practical application. Samples of parts are inspected at regular intervals as they come from the production line and the result of each observation is plotted on the quality control chart as soon as possible after the observation has been made. The plotted points serve for placing on the control chart, after a number of samples have

been inspected, two control limits. These limits give information about the condition of the manufacturing process. If a plotted point falls outside the control limits, there is some fault in the process, so that spoilage of product quality is likely to occur. This trouble should be traced and eliminated. If this is done consistently, a condition will finally be attained where all plotted points remain within the control limits placed on the chart. Then the state of control has been attained. The quality of the product may now reasonably be expected to stay within a variation equal to the spread between the control limits. However, from there on, it is not possible to reduce the variation in quality still more. The control limits corresponding to the state of control indicate the maximum accuracy that can be attained with the manufacturing process under consideration.

Operational Records Aid Designers

There are plants today where this maximum operational accuracy is determined and placed on record for each piece of equipment used in production. If the designers of the product are acquainted with these values, they should be expected to refrain from specifying tolerances on drawings that cannot be maintained in the shop. If the performance of the product requires accuracy higher than that which can be maintained in the shop, obviously there are only two ways of solving the problem. One is to change to a manufacturing process that can give the higher accuracy. This solution must be applied if random assembly of interchangeable parts is necessary. Otherwise, if the existing shop equipment must be used, selective assembly is the only possible answer.

However, where difficult tolerance problems arise, the product designer should make sure that he does not have more leeway in specifying accuracy requirements than appears at first sight. Possibly, he may be able to change his tentatively adopted specification tolerances to meet the accuracy which the shop can maintain. Such a case may exist, for example, where the designer specifies a running fit. The minimum clearance, and hence the maximum metal limits of the components may be determined by the requirement of proper lubrication. The minimum metal limits may be adopted with a view to the amount of wear that is permissible until the fit becomes too loose. The designer may then keep the new components within rather close tolerances and leave them considerable wear life. Or he may specify wider tolerances on the new parts, realizing that they will reach the condition of extreme permissible looseness sooner. In the latter case, the specification tolerances on the new parts can be larger and may be sufficient to avoid selective fitting.

These examples show that there must be close coordination and agreement between product design and production engineering. In addition to the general problem of specification and shop tolerances, there are such important questions as the choice of datum lines or planes, and cumulative tolerances. Also, the tool engineer may be able to suggest a change in the shape or proportions of a part, or in the material of which it is made. Such changes may merely provide greater facility, and hence, greater economy, in manufacturing. They may also lead to better performance or appearance of the product.

Functions Must Be Coordinated

In the earlier phases of the development of mass production, the separate functions were developed and refined, but it was forgotten that their coordination requires special attention and that action must be taken to preserve it. A modern manufacturing concern is the enlarged projection of the oldtime craftsman, whose all-around skill has become divided, not only between individuals but between entire departments. The more decentralization, the more need for coordination and, since standardization is the key to coordination, the more need for interdepartmental or company standards. The departments in the production group of a manufacturing concern are closely interwoven. Without their coordination the company operates like a symphony orchestra where each section, the string quartet, the woodwinds, and the brasses, have their own musical pitch and their own rhythm. This will not lead to harmony in musical performance. Adherence to standard pitch and the unifying action of the conductor are required. The orchestra will then live up to the slogan adopted years ago by the American Standards Association, "Standardization is dynamic, not static. It means not to stand still, but to move forward together."

The form will depend largely on the type and size of the manufacturing concern. However, two points may be stressed here. One is that the coordinating agency, installed to harmonize the standards needed by the company, must be an independent one and have the strong support of top management. The other point is that the best standards are developed by cooperation of those having a vital interest in them. Therefore, all interested parties should be expected to contribute to the formulation of company standards.

The tool engineer as a technical man is sold on the value of standards. As a member of the company team of production experts, he should be vitally interested also in the management aspect of standardization, that is, in the establishment of the administrative machinery necessary for producing standards of the best quality, for the benefit of his company, and for the benefit of his own work.

American Standard Tolerances for Ball and Roller Bearings

(Continued)

Table 4—ABEC-7 Annular Ball Bearings Except Magneto Bearings. Tolerances in 0.0001 Inch.

Inner Ring

Bore				Bore Tolerance		Radial Runout (Total Indicator Reading)	Parallelism of Sides	Side Run-Out with Bore	Groove Parallelism with Side
Mm		Inches							
Over	Incl	Over	Incl	*d* min	*d* max				
0	9	0	1/4	−1½	+0	1	1	1	1
9	18	3/8	5/8	−1½	+0	1	1	1	1
18	30	3/4	1 1/8	−1½	+0	1½	1	1½	1½
30	50	1 1/4	1½	−2	+0	1½	1	1½	1½
50	80	...	...	−2	+0	1½	1½	2	1½
80	120	...	...	−2½	+0	2	1½	2	2
120	180	...	...	−3	+0	3	2	3	3
180	250	...	...	−4	+0	3	2	3	3

Outer Ring

Outside Diameter				Outside Diameter Tolerance		Radial Runout (Total Indicator Reading)	Parallelism of Sides	Outside Diameter Squareness with Side	Groove Parallelism with Side
Mm		Inches							
Over	Incl	Over	Incl	*D* max	*D* min				
0	18	0	5/8	+0	−2	2	1	1½	2
18	30	3/4	1 1/8	+0	−2	2	1	1½	2
30	50	1 3/8	1 7/8	+0	−2	2	1	1½	2
50	80	2	2 5/8	+0	−2	2	1	1½	2
80	120	...	...	+0	−3	2	2	2	2
120	150	...	...	+0	−4	3	2	2	3
150	180	...	...	+0	−4	3	2	2	3
180	250	...	...	+0	−4	4	3	3	4
250	315	...	...	+0	−5	4	3	3	4
315	400	...	...	+0	−5	5	3	4	5

Bearings Other Than Duplex
Width of Individual Inner or Outer Ring

Nominal Bore			Width Tolerance	
Mm		Inch Type		
Over	Incl		+	−
0	180	All Sizes	0	50
180	250		0	100

Width (All Sizes)

	Tolerance	
	High	Low
Individual rings	+ 0	− 50
Assembled bearings	+50	− 50
Pair of inner or outer rings duplexed†	+ 0	−200

†If other than a pair of bearings is involved, the tolerance is in proportion to the number of bearings.

American Standard Tolerances for Ball and Roller Bearings

(Continued)

Table 5—ABEC-1 Magneto-Type Ball Bearings. Tolerances in 0.0001 Inch.

Inner Ring

Bore				Bore Tolerances				Radial Runout (Total Indicator Reading)
Mm		Inches*		Average d_m				
Over	Incl	Over	Incl	low	high	d min	d max	
0	9	0	0.3543	−3	+0	−4	+1	2
9	18	0.3543	0.7087	−3	+0	−4	+1	4
18	30	0.7087	1.1811	−4	+0	−5	+1	4

Outer Ring

Outside Diameter				Outside Diameter Tolerances				Radial Runout (Total Indicator Reading)
Mm		Inches*		Average D_m				
Over	Incl	Over	Incl	high	low	D max	D min	
0	18	0	0.7087	+4	−0	+5	−1	6
18	30	0.7087	1.1811	+4	−0	+5	−1	6
30	50	1.1811	1.9685	+5	−0	+7	−2	8
50	80	1.9685	3.1496	+5	−0	+7	−2	10

*Inch equivalents added for reference only.

Duplex Bearings*
Total Width of Inner or Outer Rings

Nominal Bore			Width Tolerance	
Mm		Inch Type		
Over	Incl		+	−
0	80	All Sizes	0	200
80	180		0	300
180	250		0	400

*If other than a pair of bearings is involved, the tolerance is in proportion to the number of bearings.

—*American Standards Association*

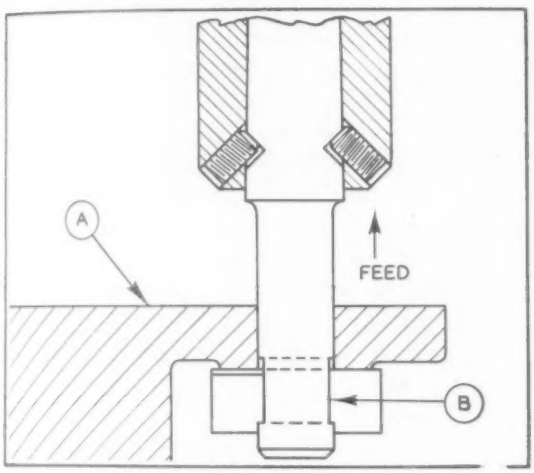
Gadgets

Ingenious Devices and Ideas to Help the Tool Engineer in His Daily Work

Locking Morse Tapers

The Morse taper, or any other standard taper, is a very efficient means for driving a drill or other tool when placed in a drill press spindle. Tapers, however, tend to come out of engagement when the cutting tool to which they are attached is subject to vibration, or when the cutting pressure acts in a direction which will tend to separate them.

One instance of this is in the action of back-facing a boss on a casting, A, by means of a tool bit which fits into a slot, B, in a bar. Here, the cutting pressure is applied to the tool bit by an upward feeding pressure on the drill spindle. If the cast face of the boss is rough, the jerking motion transmitted to the taper drive will cause the taper shank to become disengaged from the spindle.

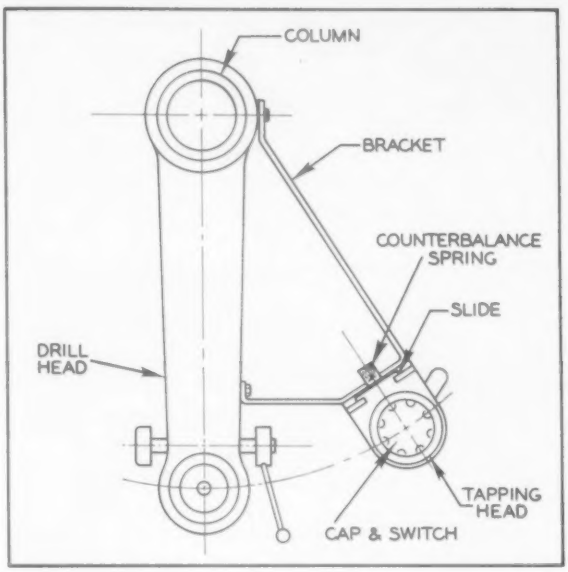


This trouble can be overcome by providing means for holding the tapers positively in engagement. First, two flats are filed at opposite sides of the bottom end of the drill press spindle at an angle of 45 degrees to the spindle axis. Two holes are drilled in the spindle and tapped for set screws with their axes at 45 degrees to the spindle axis. The set ends engage with a pair of angular flats which are ground or filed in the perimeter of the taper shank.

Tom Brown
Middlesex, England

Production Tapping Arrangement

Producing a #10-24 tapped hole in the lug of a large quantity of bulky castings presented a problem. Hand-tapping was too costly and a two-spindle drill was not available, nor would it have been convenient to move the casting for each operation. Quick change tool holders could have been employed, but the conversion of a bench drill press by attaching a tapping head as shown here offered



a better solution. The resulting arrangement turned out to be practical and very efficient for a number of similar applications.

A bracket attached to the drill head contains a verticle slide on which is mounted the tapping head. A thrust collar clamped onto the column carries the drill head and permits it to swing around the column when the clamps are released. This permits one spindle to be swung aside and the other positioned for the operation required. The axis of both spindles must be located at the same radius with respect to the column. Minimum movement for rotating either spindle into position results in a bracket design which requires the removal of two of the three handles for feeding the drill.

For this particular application, an electric impact wrench or nut runner was used as the tapping head. It was secured to the slide by clamps which held it firmly and yet permitted easy removal for other operations. A long counterbalance spring holds the tapping head in a raised position when not in use, but does not impair movement during the tapping operation.

The cap or reversing switch at the end of the impact tool provides a convenient means of manual control and operation of the tapping head. Indexing stops, drill jigs and other accessories can be installed as required.

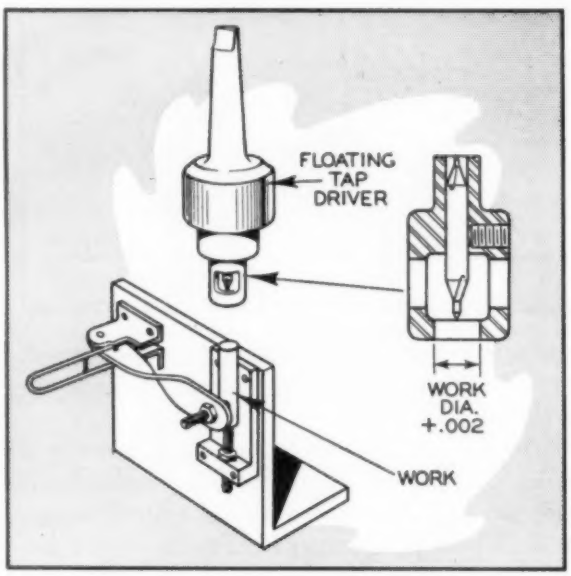
W. W. Quist
Fargo, N. D.

The Tool Engineer pays regular page rates for accepted contributions to these pages, with a minimum of $5.00 for each item.

Centering Shafts

Presented here is an ingenious method of centering shafts which is close, since the concentricity is 0.002 in., and economical, because the job can be done in a drill press which costs less than a lathe; using the drill press also cuts the time by half.

The work is placed in a Vee on an angle iron, as shown in the sketch, with a quick clamp to hold it in the Vee. The angle iron is strapped to the drill press table so that the center of the work is just about under the drill press spindle.



In the drill press spindle, insert a floating tap driver. Instead of a tap, use the gadget shown in the sketch, which consists of a steel sleeve bored to receive a combination center drill, then counterbored to 0.002 in. larger than the OD of the shaft to be worked. Provide a pair of windows in the sleeve to let the chips out, a set screw to secure the center drill, and a hub on the upper end for the tap driver to bite.

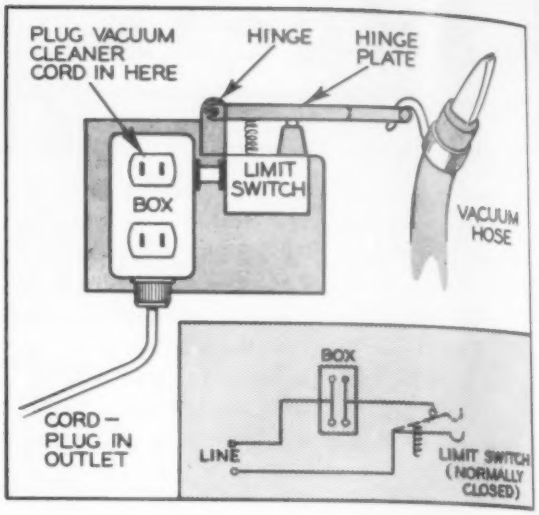
Obviously, the floating feature will allow the sleeve to center the tool over the work regardless of small errors in alignment between work and drill press spindle. There will be a minimum of tool breakage because of the sensitivity of the drill press.

Keith Douglas
Waltham, Mass.

Flux Recovery Unit

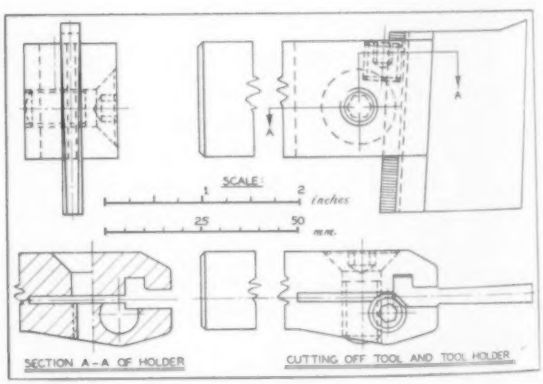
An automatic switch can be installed to control the operation of the vacuum cleaners sometimes used to recover the powdered welding flux used in automatic welding. The switch then prevents the operator from letting the cleaner run continuously.

The switch is constructed thus: a steel bracket with a clamp on its back side is equipped with an electric junction box containing a double receptacle. An extension cord leads from the box to a wall



outlet. Onto the same bracket is fastened a normally closed limit switch which is actuated by a hinged plate. A hole in this plate receives a hook which in turn is fastened to the cleaner hose with a metal band. The switch is electrically connected to the junction box as shown in the wiring diagram, and the vacuum cleaner is plugged into one of the receptacles. The circuit, however, remains open until the operator lifts the hose from the hinged plate. A spring (to reinforce the switch spring) helps close the circuit and the cleaner operates until the hose is replaced. Since the whole bracket can be clamped at any convenient spot, the unit also increases motion economy.

H. G. Frommer
Milwaukee, Wis.



Cutting-Off Tool

The design for a cutting-off tool and its holder is shown in the accompanying diagram. The cutting-off tool has a 45-degree chamfer made as a rack, and the adjustment of the cutting edge to the height of the centers is done easily by a worm-screw fitted into the holder. The tool is to be resharpened on the top face only.

L. M. Lepsöe
Bergen, Norway

International Harvester: Dollars from Manufacturing Research

By Gilbert P. Muir

THAT DOLLARS can be earned in quantity by thorough, well-directed manufacturing research is proved by the four-year operation of International Harvester's Manufacturing Research Division at Chicago. Under the direction of J. W. Armour, the center is the focal point of manufacturing research for all of Harvester's far-flung divisions.

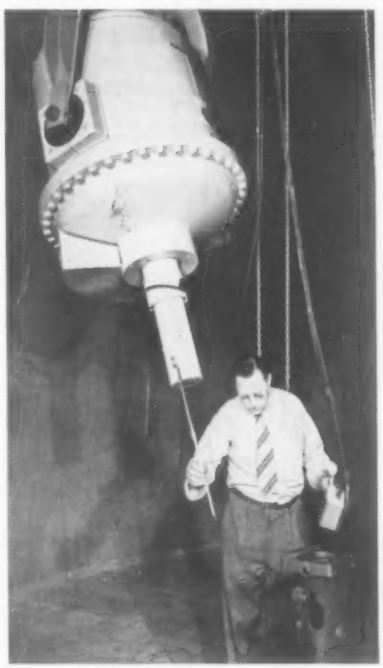
Manufacturing Research has earned many dollars for International Harvester—several times more dollars than were invested in its plant and facilities a few years ago. Its projects have included a company-wide statistical quality control program which has reduced rework, scrap and inspection costs over $10,000,000 over the last four years. Other successful projects have included development of more economical production processes, improved tooling and machines, materials substitutions and cost-cutting standardization programs.

Harvester's Manufacturing Research department was established with the following basic policies as a guide:

"(1) To study and conduct research concerning technical manufacturing activities of all kinds. To assure Harvester that it would be in close touch with technical progress . . .

"(2) To formulate standards of manufacturing practices to be followed by the company's various divisional manufacturing departments.

"(3) To conduct manufacturing operations research directed toward continual study and improvement of the organization and management of Harvester's manufacturing activities."



A million-volt X-ray examination of a tractor casting at Harvester's Manufacturing Department.

These quotes represent the thinking of Harvester's president when he established a centralized Manufacturing Research organization in 1944 as a result of Harvester's planning for postwar expansion. The department represented an initial investment of $4,000,000, and expansions since then, particularly in the foundry section, have increased this substantially.

The Tally

The most direct proof of Harvester's success with its manufacturing research program lies in the case histories of its completed projects. A brief glance at various projects turned up a problem of reclaiming waste sand from foundry operations. Manufacturing Research evaluated the numerous processes available as well as the economics of the plan, finally came up with a recommendation for the hydro blast or washing process. Several hundred thousand dollars can be realized through application of the process at two Harvester plants.

A design and process change for lower production cost is another example of the department's service to the company. The part involved is a picker spindle for Harvester's cotton picker, and the change involved was from machining to a cold heading operation on the gear end, and a hot swedging sequence to develop a

tapered end on the spindle. Upsetting was formerly used to develop the picking barbs along the taper; in the redesigned piece the teeth are broached diagonally along flutes milled into the taper. In addition to the reduction of stock loss, the changes represent a labor saving of about one-third on an item whose annual output is about 3,750,000 pieces.

A materials and process change on a spindle drive shaft produced a savings of 24 per cent in material and 18 per cent in labor. A company-wide program of salvaging worn-out or broken carbide tool tips will produce annual dividends in six figures. Another plan for disposal of forging scale from Harvester's plants means that an estimated 8000 gross tons of scale from the tractor, automotive and implement plants will be sold annually at prices ranging from $10 to $20 a ton. Interchange of tools between plants, where stock is being held that is unusable at the holding plant but which can be utilized by another plant, has produced a company-wide savings of $297,200 in four years.

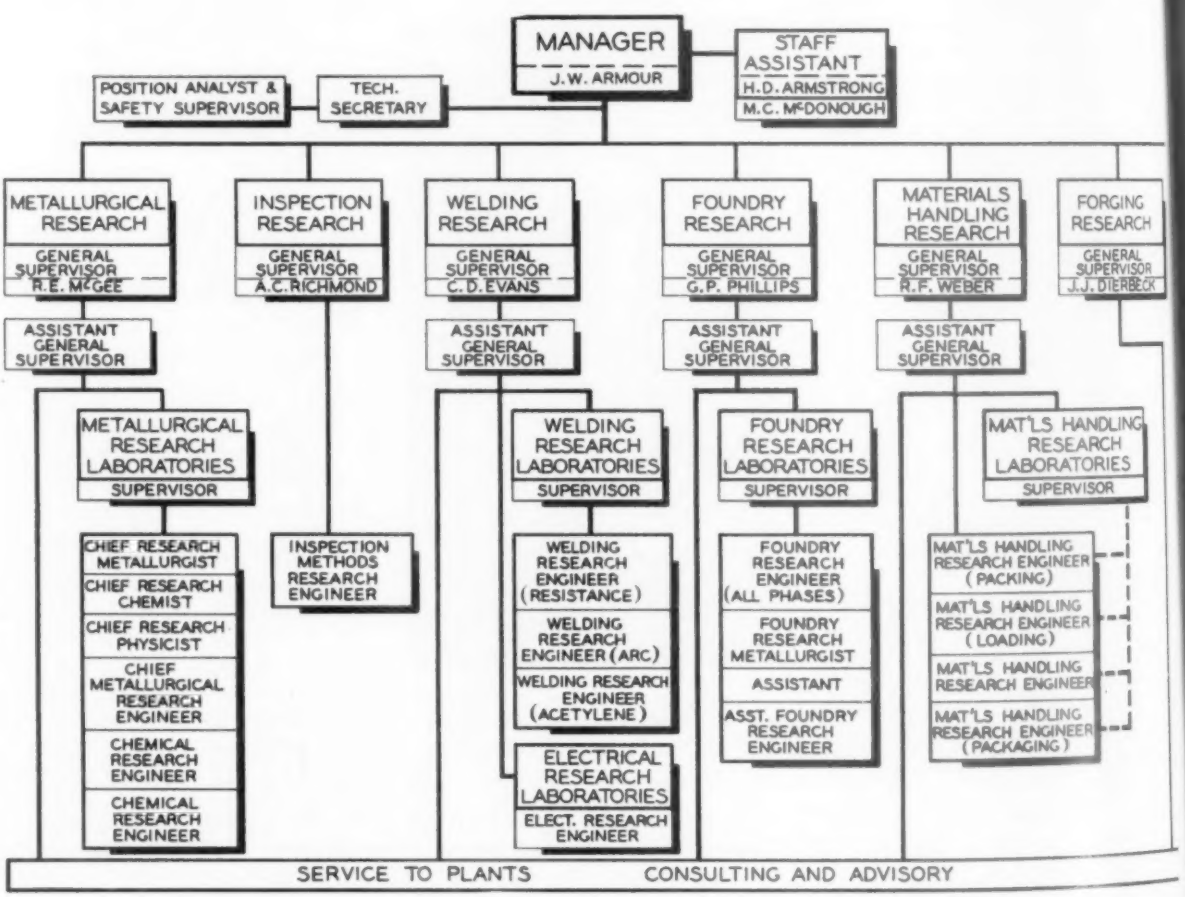
These represent a handful of the dollars-and-cents reasons why manufacturing research pays off. Perhaps any of the cases cited here can and have been duplicated without the advantage of a central group such as the manufacturing research division. The important point, however, is that there is a relation between the dollars granted and freedom given to a permanent research group, and the dollar dividends realized by the company.

The Project

Under Harvester's policy, manufacturing research projects can originate from the company's manufacturing plants, from the general office administrative staff, from sales departments and from product engineers. Many of the projects originate, of course, in the research organization itself.

Problems submitted to Manufacturing Research are reviewed by a screening committee composed of the heads of the various sections and directed by J. W. Armour. A briefing is prepared for the committee by the sections directly concerned with the proposed project, and committee consideration is directed toward such factors as availability of facilities and personnel, potential return to

The Staff Organization of International



the company from successful solution of the problem, importance of the project in relation to work currently on the docket and, ssuming acceptance of the project, its placement on the work schedule.

The cost of a proposed project in terms of required tooling, man-hours and equipment is outlined in the preliminary report to the screening committee by the interested section heads. This and subsequent controls help to assure that the cost of a project will not exceed its expected return to the company.

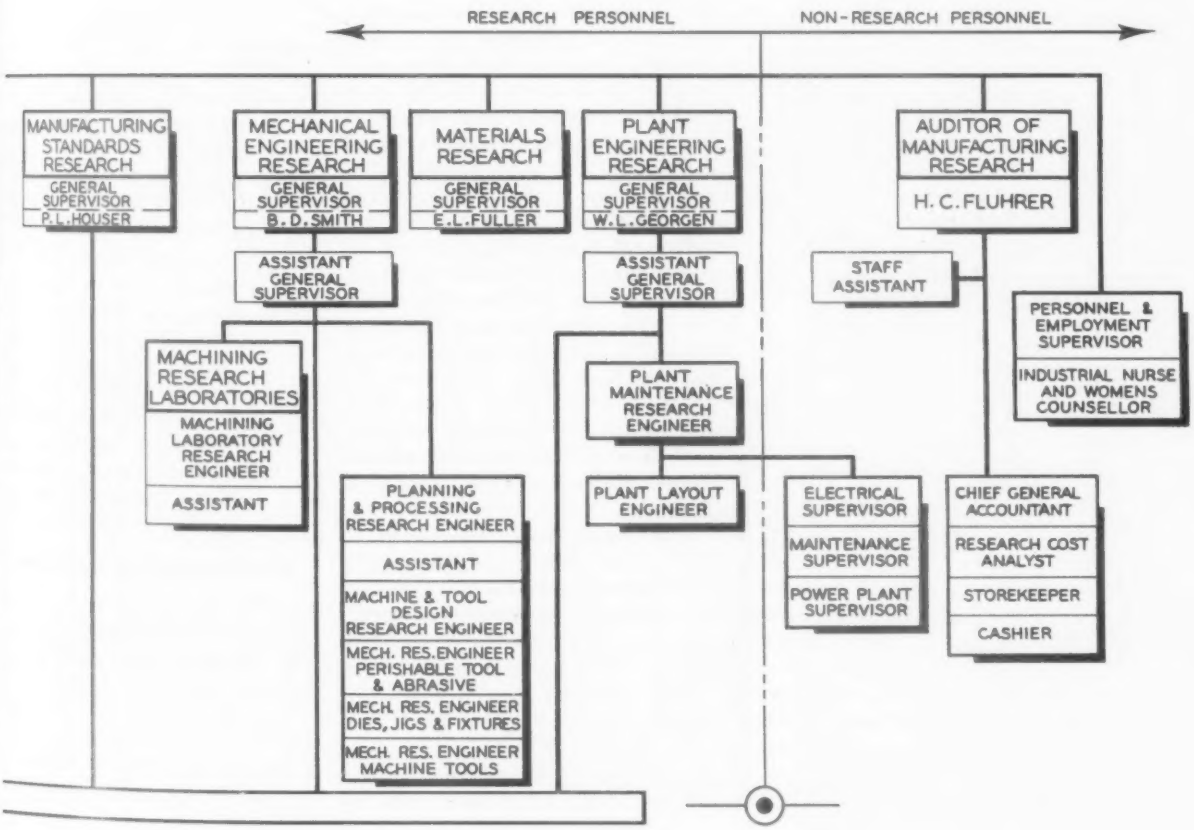
Control in process is handled by assigning an accepted project to one of the sections in the department, which section then can issue interior orders for such work as might be required from other sections in the center. Costs are reviewed periodically through the life of the project and, if it appears that the expenditure-to-return factor is out of balance, the project may be discontinued.

Here we come to an important distinction as far as Harvester operation is concerned. While emphasizing the desirability of expending research effort in the proper direction, Manufacturing Research believes that, in the words of Director Armour, "Individual initiative and independent thinking will produce the best results, and these fundamental research attributes must not be stifled by the fear of exceeding a predetermined estimate of what should be spent on a given study. Costs are watched—they are important—but they are not waved at research people."

Company Committees

Since the Manufacturing Research department is a central agency serving all parts of the Harvester organization, an important part of its work lends itself to operation through company-wide committees. Made up of representatives from the plants of each operating division with a staff member of Research as chairman, the committees make it possible to introduce such company-wide programs as statistical quality control and standardization projects. The committee structure is important as a two-way information pipeline, and as a tool for direct attack on manufacturing problems.

Harvester's Manufacturing Research Dept.



THE SECTIONS

Mechanical Engineering

Six units comprise the mechanical engineering section at Research: planning and processing; machine and tool design; machine tools; perishable tools; die, jigs and fixtures and the machining laboratory. The section is concerned with all problems of mechanical and production engineering relative to the production and cost of machines and equipment for the various Harvester operations, and in addition acts as a service center for other sections.

Planning and processing includes methods studies, investigation of new manufacturing processes, and consideration of manufacture of new products or products currently being produced outside the company. Studies of current engineering problems, and cost surveys of present products to determine opportunities for cost reduction are two additional functions of this unit.

The latter activity is particularly important, as attested by several of the case histories previously cited. Procedure is to dismantle the product and analyze each part to determine whether the present design and method of manufacture represent the minimum manufacturing cost. Studies may indicate changes of material, design or production method. This is a continuing operation—one of the benefits of continuous manufacturing research.

Machine and tool design is primarily a service function on behalf of the Research sections and manufacturing plants. Machine tool, tooling, test equipment and special machine designs are provided and, in addition, the unit handles requests for project, program or tool estimates.

The *machine tool unit* has the function generally of keeping abreast of the latest developments in machine tools and equipment. Tests of machines to determine advantages and limitations are a part of this function, and results of such tests are circulated to the various plants. The advantage of a specialized central agency is seen in two added services: coordination on possible further use of obsolete or surplus machines; and aid in standardizing equipment, performance characteristics and maintenance among plants.

Manufacturing Research's 60,000-lb tensile machine in operation. Under test is a bolt. The extensometer was developed at Research.

Under the *perishable tool unit* are listed a number of important phases of machining and machinability. First is the development of procedures for procurement and handling of production perishable tools, and the reclaiming and salvage of broken or damaged tools. Through committees the unit fosters active participation in these programs on the part of the manufacturing plants.

Investigations are made and reports circulated on new tools developed either within or outside the Harvester organization. The unit handles comparative laboratory tests on machinability, coolants and abrasives to determine proper feeds and speeds, tool design and material, coolant specifications and grinding wheel grades for various applications.

The program of interchange of obsolete perishable tools among the plants also is a function of this unit, including the maintenance of a running inventory and the active "selling" of available tools to the plants.

Dies, jigs and fixtures deals with construction materials, production life, design, standardization and manufacture of this equipment. Continuous studies are made by the unit both at Manufacturing Research and, where advantageous, at individual plants. The unit carries on investigations of die lubricants and drawing compounds, and performs a consulting service to Harvester plants on unusual manufacturing problems.

The *machining laboratory unit* of mechanical engineering operates as follows:

1. Develops, produces and tests experimental parts connected with a project or program which have been designed to effect a potential cost reduction and/or higher product quality.
2. Frequently the projects of other sections require dies and fixtures, in addition to mechanical assistance, both of which are furnished by this unit.
3. Laboratory assistance to company plants to assist with production problems.
4. Maintenance of production machines through the Manufacturing Research organization.

Manufacturing Standards

The Manufacturing Standards section, through its publications, carries to all Harvester operations the approved results, in the form of Manufacturing Standards and Manufacturing Materials Specifications, of specific project investigations.

The section personnel actively

participate in national standardization work, thus contributing to and receiving the benefits of group participation in this field. They also coordinate their activities with other sections of Manufacturing Research and with other divisions and areas of the company.

One of the practical accomplishments of the section is exemplified by the company's manufacturing standard on industrial diamonds. Before standardization began, the Harvester organization used some 136 sizes and types. After thorough discussions in committee sessions with representatives from the plants, a manufacturing standard was finally adopted which specifies four basic standard sizes and types, plus a few specials for specific applications.

Inspection

The figure of $10,000,000 cited earlier is an impressive example of what quality control can do for a manufacturing operation. The sum represents the progressive cumulative reduction of scrap losses and rework through the Harvester organization over the past four years that the program has been in effect.

The inspection methods research section has actively promoted this program and has assisted manufacturing plants in this accomplishment.

Plant Engineering

Staffed with industrial engineers and available to the plants for consultation, the plant engineering section carries on a continuing study of plant layout, plant equipment and maintenance problems. It maintains a laboratory for research on electrical problems, and works with the materials handling section in joint investigations of this phase of plant operation.

Materials Research

The materials research section is a recent addition to the Manufacturing Research department. It is the product of Harvester's recognition that redesign of products to take advantage of better-adapted materials represents an important factor in effecting production economies—dollar dividends.

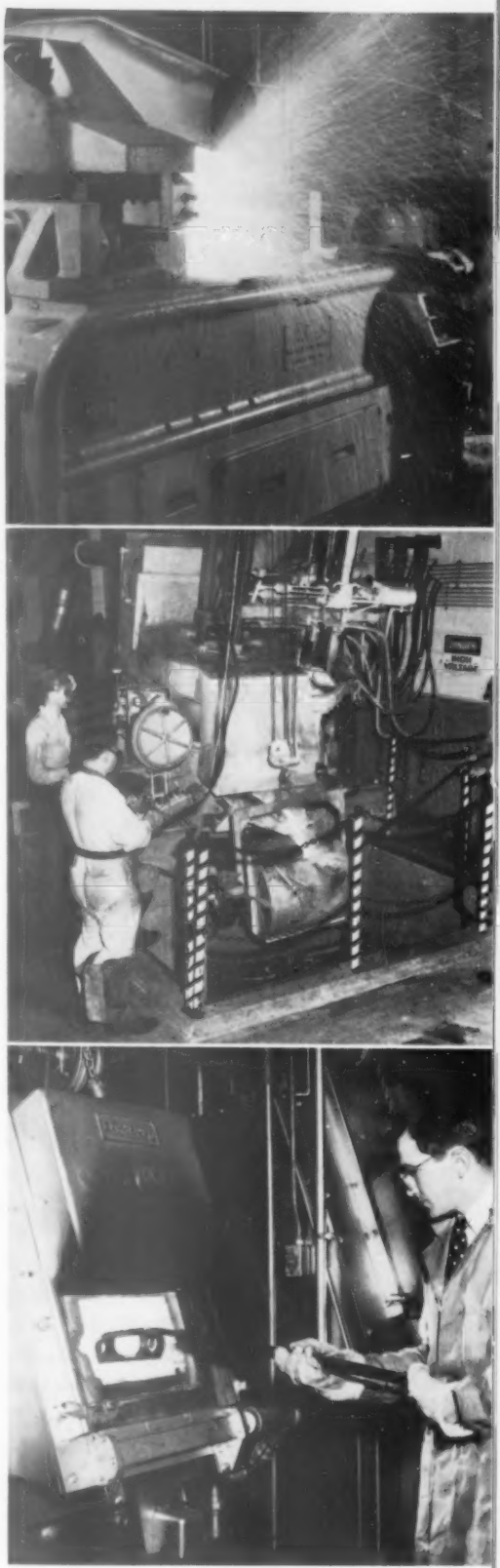
This section, while it does not as yet have its own laboratory, studies Harvester products from the standpoint of substituting a common material which can reduce manufacturing cost or increase product quality as one part of its work. The other part is a continuous study of the new materials, checking their potentials against Harvester products for a possible advantogeous redesign.

Four additional sections of heavy importance to Harvester are the metallurgical, foundry, welding and forging sections. The metallurgical section includes a chemistry laboratory, a physics laboratory, a metallurgical laboratory and a metallurgical engineering unit. The section functions on heat treating operations, properties of metals, investigations of protective coatings and product protection.

With some 8,000 people employed in Harvester's ten gray iron and three malleable iron foundries in the United States and Canada, foundry problems are a major concern. Research's foundry section has been augmented by a complete experimental foundry, part of which went into operation in 1950, with the second stage nearing completion.

The Dividends

Does manufacturing research pay off? In the words of J. W. Armour—"Not on its own books. This may sound out of tune, but it is true. At Manufacturing Research we do not necessarily balance our books each year in the sense of dollar income equalling dollar outgo. We spend the money and we have the outgo. The manufacturing operations reap the income in the form of saving and economies. As a result of development and research conducted by this organization, economies of several times the cost of this facility have been realized by our manufacturing plants."



Three sections of Harvester's Top—Flash welding 12-in. sq. steel sections. Center—Tapping an experimental heat of cast iron in the electric arc furnace. Bottom—Controlled atmosphere heat treatment of a tractor track link.

Exposition Attendance Breaks

Registration figures reached an all-time high at ASTE's 1952 exposition held March 17-21 in Chicago. The more than 38,000 persons who visited the International Amphitheatre broke all previous attendance records.

Stormy weather failed to keep away the crowds. Traffic at peak hours was slow, even by metropolitan standards, with buses, taxi cabs and private cars driving in a steady stream to and from the Amphitheatre.

By Thursday exhibitors were running out of many kinds of descriptive literature and inquiry forms.

Throngs of people were still viewing, studying and inspecting the exhibits late Friday, the last day of the show. It was after six before the last visitor left and the doors closed on the most successful exposition and annual meeting in ASTE history.

Enthusiasm penetrated every phase of activity. The banquet and annual membership meeting in the main ballroom of the Conrad Hilton Hotel were attended by more than 1,500 members and their guests. Charles E. Wilson's address attracted many others who stood throughout the speech.

Officials of the hotel willing, any strong-armed engineer could have moved the plant tour registra-

All Records

By Nancy L. Morgan

tion booth to the main lobby and the early morning crowd would still have approximated Grand Central Station.

Meeting some one to go on a tour of U. S. Steel or Scully-Jones at that hour became a full-scale production. The only thing missing about using any of the 14 elevators was the 'take a number and wait your turn' system used by many retail stores during the war.

Buses to take the ASTE'ers to Kropp Forge, Thor, Western Electric or on any of the other tours were parked the length of nearly two long city blocks while loading passengers.

Technical sessions provided a wide scope of subject matter for thousands of engineers, production chiefs and executives.

Spread out over five specially designated feature days, the programs were presented in the Saddle & Sirloin Club at the Stock Yards Inn, two ballrooms at the Hilton and in the Red Lacquer Room of the Palmer House.

Morning, afternoon and evening papers were delivered by some of the nation's foremost engineering talent. Printed papers were passed out to members of all audiences after the authors had presented them. Spirited question and answer periods punctuated most meetings.

Fire Hits Amphitheatre

A fire in Precision Control Hall early Tuesday evening caused $750,000 of damage to displays of 19 exhibitors. Original estimates from Chicago's Fire Department placed the total loss at only $10,000.

Most of the damage to the precision equipment was caused by water. Authorities said electric wiring began the fire.

A tribute to ingenuity and industry, most of the booths were reconstructed and put back in order for exposition crowds within 24 hours, no mean accomplishment considering all the planning and designing that goes into such exhibits.

Visitors who filled out cards requesting literature from the following firms are advised to re-submit their inquiries since many of these records were destroyed in the fire.

Pratt & Whitney Div., Niles, Bement-Pond Co., Charter Oak Boulevard, West Hartford, Conn., Eastman Kodak Co., 343 State St., Rochester 4, N. Y.

Ercona Corp., 527 Fifth Ave., New York 17, N. Y.; Republic Gage Co., 2228 Fenkell Ave., Detroit 21, Mich.; Universal-Cyclops Steel Corp., Station St., Bridgeville, Pa.

Engis Equipment Co., 431 S. Dearborn St., Chicago 5. Chicago Dial Indicator Co., 180 N. Wacker Drive, Chicago 6. Stokerunit Corp., 4548 W. Mitchell St., Milwaukee 46, Wis. The McCaskey Register Co., Alliance, Ohio.

Bryant Chucking Grinder Co., Clinton St., Springfield, Va. Rahn Granite Surface Plate Co., 641 N. Western Ave., Dayton 7, Ohio. B. C. Ames Co., 131 Lexington St., Waltham 54, Mass.

Collins Micro-Flat Co., 2326 E. Eighth St., Los Angeles 21. Enco Manufacturing Co., 4520-26 W. Fullerton Ave., Chicago 39. Steel City Testing Machines, Inc., 8843 Livernois Ave., Detroit 4.

R. B. Annis Co., 1101 N. Delaware St., Indianapolis 2. The Taft-Peirce Manufacturing Co., 32 Mechanic Avenue, Woonsocket, R. I. International Harvester Co., Manufacturing Research Dept., 5225

Typical of the large crowds which were attracted to exhibits at the exposition is this group at the display of machine tools, cutting tools and gages sponsored by the DoAll Co. of Des Plaines, Illinois.

W. Western Blvd., Chicago 9. Nilsson Gage Co., Inc., 2 Lake St., Poughkeepsie, N. Y.

Steel had more than its usual influence on tool engineering during the week of the exposition. Negotiations in the steel dispute sent Defense Mobilizer Charles E. Wilson, who was to have delivered the banquet address, to Key West at President Truman's request.

His address was made by Dr. Arthur S. Flemming, special advisor and assistant to Mr. Wilson on manpower problems. Dr. Flemming flew in from Washington just shortly before the banquet began and was whisked to the hotel in a 20-minute ride with a police escort.

Dr. Flemming is on leave from his position as president of Ohio Wesleyan University and is currently chairman of the Manpower Policy Commission of the Office of Defense Mobilization.

1953 Annual Meeting

The Time and Place Committee has been appointed by ASTE president L. B. Bellamy to select the site of the 1953 annual meeting.

Chapters planning to extend invitations to the Society should submit them in writing to national headquarters in Detroit.

Members of the committee are to meet in one month to consider the invitations and make their selection.

Radio coverage of the exposition was highlighted by the appearance March 16 of A. M. Sargent, past president of ASTE and president of Pioneer Pump and Manufacturing Co., Detroit, on the Northwestern Reviewing Stand, sponsored by Northwestern University, over radio station WGN. The program was aired later from coast to coast.

Discussing "Can We Have Both Guns and Butter?" with Mr. Sargent on the broadcast were John S. Coleman, president of Burroughs Adding Machine Co., and Swan Bergstrom, vice president of Cincinnati Milling Machine Co., and head of the metal working equipment division of the National Production Authority.

Top photograph: One of the guides at the Thor Corp., manufacturers of washing machines and other home appliances, conducts ASTE visitors through the casting department. Below: Two employees show a plant tour group how cores are made for castings at Thor.

Left: Visitors talk with representatives of Danly Machine Specialties, Inc. Right: A group studies the exhibit of optical comparators and measuring instruments at the Jones & Lamson Machine Co. booth.

Reprints of the program, according to present plans, will be made available to ASTE members.

The board of directors met in a day-long session at the headquarters hotel. The annual election of officers climaxed the meeting. Committee reports were received and discussed and official matters voted upon while in the ballroom the House of Delegates was holding its caucus preceding the election of board members for 1952-53. New directors were named in Monday's balloting.

National committees of the Society met formally and informally throughout the week to consider their particular programs and make plans for the coming year of progress in ASTE.

Ladies' Program

Nor were the ASTE wives forgotten in the busy round of activities. They toured the Conrad Hilton, to see behind the scenes of the world's largest hotel, and the Merchandise Mart, largest building of its kind in the world.

They saw the Art Institute, Marshall Field and Co. and took a sight-seeing tour of Chicago. The exhibits at the Museum of Natural History and the Aquarium were also included on their program.

And, of course, ASTE wives participated in Thursday's banquet at the hotel.

The Committee

Long hours of work on the part of ASTE committee chairmen and members went into the 1952 exposition and annual meeting.

Serving on the National Show Committee were J. J. Demuth, G. A. Goodwin, F. J. Schmitt and Harry E. Conrad. Members of the National Program Committee, Gardner Young, chairman, were J. O. Horne, T. C. Barber, K. W. Riddle and C. J. Helton and Frank Wilson, ASTE technical director.

With Dale Long as chairman and Marshall A. Blu as co-chairman, the show committee of the Chicago chapter included A. L. Winkler, A. H. Ettinger, W. W. Haskins, Clare Bryan, Mrs. Marian Miller, Robert Osborn, Fred Rust, Harry Paine, H. H. Katz, A. J. Schwister, B. A. Fluery, Jr., G. J. Benes, H. V. Leoppert, Joseph Early, E. K. Dayne, E. W. Dickett, A. W. Blackshaw and J. H. Beck.

Top photograph: A vertical hydraulic press attracts the attention of a group of plant guests at the Clearing Machine Co. Below: The Clearing tour takes visitors to the engineering department where one of the guides explains a part print of a Clearing design.

ASTE's 1952-1953 board is shown at its Chicago meeting. Back row, from left are: Dr. H. B. Osborn, Jr., Roger F. Waindle, Harry E. Conrad, J. J. Demuth, L. B. Bellamy, T. J. Donovan, Jr., H. C. McMillen. Left grouping: E. W. Ernst, Joseph E. Crosby, and George A. Goodwin. Right grouping: W. B. McClellan, B. J. Hazewinkel (arms on table), H. L. Tigges, H. E. Collins. They met in a day-long session on Sunday.

L. B. Bellamy Elected ASTE President

Leslie B. Bellamy, Detroit manager, Sterling Grinding Wheel Div., Cleveland Quarries was elected president of ASTE for 1952-53 at the meeting of the Society board of directors held Sunday, March 16 in Chicago.

First vice-president is Roger F. Waindle, director of research, Nugent Sand Co., Inc., Muskegon, Mich. J. P. Crosby, vice-president of The Lapointe Machine Tool Co., Hudson, Mass., was named second vice-president and Dr. Harry B. Osborn, Jr., technical director Tocco Div., The Ohio Crankshaft Co., Cleveland, was named third vice-president.

H. C. McMillen, plant manager, Philco Corp., Bedford, Ind., was re-elected treasurer of ASTE. H. E. Collins, chief production engineer, Hughes Tool Co., Houston, Texas, was elected secretary.

The position of assistant secretary-treasurer is filled by Gerald A. Rogers of the Rudel Machinery Co., Ltd., Montreal.

New Directors

New directors of the Society are Willis G. Ehrhardt, managing partner, Ehrhardt Tool and Machine Co., St. Louis; Gerald A. Rogers, Fred J. Schmitt, director of sales, D. A. Stuart Oil Co., Chicago; and Roger F. Waindle. They will be sworn into office next October.

Re-elected to the board were L. B. Bellamy; Thomas J. Donovan, Jr., owner, Donovan Co., Philadelphia; Harry B. Osborn, Jr.; George A. Goodwin, chief process engineer, The Master Electric Co., Dayton, Ohio; Ben J. Hazewinkel, president, Daily Grinding, Inc., South Gate, Calif.; and W. B. McClellan, engineer, Gairing Tool Co., Detroit.

J. J. Demuth, who presided at the board meeting as the 1951-52 ASTE president, also serves as a director.

Mr. Bellamy was first vice-president during the past year and is also a past chairman of the Detroit chapter and the Society's Standards Committee.

Increase in Reserves

The board of directors approved an increase of $25,000 in the reserve for industrial research which now stands at $48,000. An emergency reserve fund was set up for $200,000.

Also favorably voted upon was the $50,000 investment reserve for endowment of scholarships.

By vote of the board members, the 1952 semi-annual board of directors meeting will be held on October 10 and 11.

March 17 through 21 were set aside as the dates of the 1953 Leadership Conference to be held in Detroit. The conference will serve as a medium whereby chapter officers, National Committees and national headquarters can establish a closer understanding of ASTE services, aims and operations.

The dedication of the headquarters building will be an event of this meeting.

The selection of the sites for the 1955 annual meeting and the 1956 annual meeting and exposition will be made by a committee appointed by President Bellamy.

The National Membership Committee reported that the goal of 20,000 members by March 1, 1952 had been reached and that total membership in the Society stood at approximately 20,355 by that date.

In accepting the report of the Special Committee on Professional Engineering, the board recommended to the Constitution and By-Laws Committee that it prepare an amendment to the constitution to set up a permanent committee on professional engineering.

Education Committee

The National Education Committee reported that the 1952 award applications have been mailed and winners will be announced this spring.

Engineering faculty members from the midwest area met with the education committee on March 17 to study tool engineering education in colleges and universities.

In the report of the National Program Committee, the success of the South Central Area meeting held in Evansville last October was noted and plans were announced for a similar meeting in Dallas, May 30-31.

Also underlined in the program report was the success of tool engineering seminars, such as those meetings held at the University of Illinois and Southern Illinois College. In addition to being educational to ASTE membership, these seminars are highly influential in bringing the activity of the Society before educators, students and local industry and their regional geographic locations attract additional attendance.

Standards Report

ASTE's National Standards Committee reported on the meeting called February 1, 1952, to study standardization of industrial diamonds.

A steering committee was formed to gather information on the size of diamond tool holders from machine tool manufacturers and to prepare nomenclature on diamond tools.

Included in the attendance were representatives of the National Machine Tool Builders Association, Industrial Diamond Association, Joint Industrial Conference, Grinding Wheel Institute, Navy Department and NSC.

Top photograph: L. B. Bellamy (right) talks with B. J. Hazewinkel at the reception for officers and directors held before the banquet. H. L. Tigges (center) and Frank Shuler (right), past president of ASTE are shown with George Johnson in the photograph below. Others at the reception were Mrs. George Goodwin (left) and Mrs. J. J. Demuth. Mr. Goodwin and Past President I. F. Holland are standing. Bottom: Mr. Demuth is shown with the Rt. Rev. Wallace E. Conkling, who delivered the banquet invocation.

Machine Tool Industry to Operate at Peak: Wilson

Past President J. J. Demuth and newly-elected ASTE President L. B. Bellamy talk with the Rt. Reverend Wallace E. Conkling at the banquet.

"Production of machine tools will reach $100 million per month by May or June of this year and continue at this level for about a year," was a highpoint of Charles E. Wilson's message to more than 1,500 ASTE members and their guests at the 20th annual banquet held Thursday evening in the grand ballroom of the Conrad Hilton Hotel.

A crisis in the steel situation prevented Mr. Wilson from delivering his address in person. President Truman had called him to Key West for consultation.

The speech was given by special advisor and assistant to the defense mobilizer, Dr. Arthur S. Flemming who is chairman of the Manpower Policy Commission. He is on leave from his position as president of Ohio Wesleyan University.

Dr. Flemming said that the major bottlenecks to increased machine tool production have been overcome and that the backlog of orders has been cut from a high of 23 months to under 18 months at the present time.

"Everyone here realizes," he said, "the dependence of the mobilization base upon a constant supply of up-to-date machine tools to meet the changing designs in the newer weapons."

"Never again can we allow military production to be held up while we wait on machine tools," Dr. Flemming continued. "And we must see to it that the industry does not return again to the feast-and-famine existence of the past."

Speaking on the expansion of the military production and defense procurement programs, Dr. Flemming said the original three-year period was extended to four years to avoid a tremendous waste of critical materials in the form of obsolete weapons.

"If the Air Force, for example, had frozen its designs immediately following the Korean aggression, we would be turning out such a volume of planes today that we would soon have numerical superiority over the Russians. But the military have put a premium upon quality in the equipment they want for our armed forces. We want the best that the risk of time will allow."

In answer to those who still ask if we are lessening our effort to gain superiority in the sky, Dr. Flemming stated that production of jet planes and tanks will soar to an astonishing rate.

"By the end of 1952, the rate of production of jet planes of all kinds will be almost 250 per cent of what it was at the end of 1951. In the following two years, this production will be maintained at a rate that will be still another 25 per cent higher."

"In the end, we will have the finest equipped

First Vice President Roger F. Waindle, Director T. J. Donovan, Jr., and Treasurer H. C. McMillen enjoy a story between courses.

The oath of office is taken by President L. B. Bellamy (far left), First Vice President Roger F. Waindle, Second Vice President J. E. Crosby, Third Vice President Harry B. Osborn, Secretary H. E. Collins, Treasurer H. C. McMillen and Assistant Secretary-Treasurer Gerald A. Rogers.

Air Force in the world and the plant capacity to maintain it as the most powerful Air Force in the world," Dr. Flemming said.

"Enormous feats of engineering skill are required to build the mobilization bases we must have—not only to maintain our limited mobilization schedules, but to give a much greater volume of materials of defense if all-out worldwide war is forced upon us by Soviet Russia.

"The magnitude of the job is dramatically seen in the new forging and extrusion presses needed to turn out the airframes of jet bombers and fighters," Dr. Flemming said.

"We are building 17 of these presses of varying sizes at a total cost of half a billion dollars and they are much, much finer presses than those seized in Germany by the Russians. The largest, the 50,000 ton job, will be as tall as a nine-story building and will have an almost unbelievable squeezing force of 100 million pounds."

Dr. Arthur S. Flemming, chairman of the Manpower Policy Commission, delivered the address prepared by Defense Mobilizer Wilson.

Official ceremonies of the 20th annual membership meeting preceded Dr. Flemming's address.

J. J. Demuth made his last official speech as president of the American Society of Tool Engineers. He gave his thanks to each individual and each group "over these United States and Canada who have given so much of their time and effort through this wonderful year."

Mr. Demuth administered the oath of office to ASTE's new officers headed by President L. B. Bellamy, who later gave a short talk on the Society.

A life membership was presented to Mr. Demuth who also received the past president's pin from A. M. Sargent.

The president's pin was given to Mr. Bellamy by William Smila.

Executive Secretary Harry E. Conrad, acting as toastmaster, introduced those seated at the head table. He extended the appreciation of the Society to Marshall A. Blu, the Chicago chapter and the ladies' program committee for their fine work in making the exposition week such a success.

The invocation was delivered by the Rt. Reverend Wallace E. Conkling, bishop of the Episcopal Diocese of Chicago.

At Monday's panel (left) on turning and forming tolerances are shown Robert Eckholm, N. G. Meagley, E. L. Fay, R. B. Knoth, J. T. Leyden, W. T. Nystrom and G. R. Morin.

Right: A. W. Grove and Harry Paine of the Chicago committee; D. E. Hawkinson, daily chairman; Dr. J. V. Strela, speaker; and Gardner Young, NPC, shown at a Monday session

Of Men and Papers at the Annual Meeting . . .

Left: Dr. C. R. Lewis and A. F. Underwood are pictured at an evening session held Wednesday. Center: G. H. Rigeman (left), and speaker John Loxham at a meeting on quality control held Monday evening. Right: With Dr. S. C. Fletcher, speaker on selection of die steels, is chairman E. J. Kane, shown at the right, who conducted the Wednesday afternoon meeting.

Left: D. H. Brighton (left) was daily chairman for a session at which the speaker was H. A. Erickson. Center: W. H. Logue (left) introduced B. H. Work at the Thursday session on precision production grinding. Right: F. C. Victory (right) spoke on precision hole locating methods at the technical session chaired by G. S. Strambeck on Tuesday afternoon.

Left: Participants in the technical session on standards were Dr. John Gaillard (left) of the American Standards Association, chairman R. C. Peterson and R. E. Gay, president of ASA.

Right: Shown at the Thursday session on grinding troubles and remedies are G. E. Bader (left), chairman Gordon Swardenski and technical speaker A. W. Todd, shown at the right.

On the Thursday panel of finish grinding were R. A. Cole, R. M. Bell, M. I. Bengtson, Adam Gabriel, J. A. Harrington and G. T. Rideout. In the photograph at the right are shown

I. L. Wallace (left) and J. S. Gillespie who spoke on new developments in cemented carbides at a technical session chaired by Jack Pritchard (center) Tuesday evening.

Left: C. R. Cory (left) spoke on die design for metal drawing at a Monday meeting. Chairman at the session was C. E. Miller. Featured speakers at the Tuesday session on recent advances in metal cutting science and practice were Hans Ernst (center) and Dr. M. E. Merchant. Chairman at the evening meeting was O. H. Arndt, shown at the rostrum.

Left: A. W. Grove and Leif Lunde, sessions arrangements, are shown with speaker J. S. Davey (right). Pictured at a Thursday meeting are R. A. Green, technical speaker, and J. O. Knight, who acted as daily chairman. Thirty-eight papers were given at the meeting.

Left: C. J. Oxford, technical speaker and chief engineer, National Twist Drill & Tool Co. Center: W. N. Reinhardt, daily chairman (left) is shown with speaker M. F. Judkins. Right: Dr. W. E. Mahin delivered a paper to an ASTE technical session audience on Monday.

Left: Chairman H. F. Ruehl is shown with V. E. Lysaght, sales manager, Wilson Mechanical Instrument Div. Center: Speaker W. H. Gourlie (left) is pictured with Chairman K. B. Kaiser. Right: Shown with G. W. Christiansen, left, is Kenneth R. Blake, a Tuesday speaker.

Left: At Thursday's grinding session are, left to right, Adam Gabriel, R. W. Bayless, A. E. Mandeville and James Meehan. At the right are (seated) E. Von Hambach, C. C. Waldo and J. Y. Riedel. Standing: C. D. Brauer, M. S. Aljanich, R. A. Schafer and E. A. Brezina.

Left: Speakers at Monday's session on contour milling were, from left: W. H. Sorenson, Jesse Daugherty and E. Y. Seborg, chairman.

G. C. Johnson (at left) and Jacques de Saugy were chairman and speaker, respectively, at Monday's session on measurement.

Wednesday's panel on dies included, from left (seated) Ralph Weisbeck, S. H. Ericson, Walter Gulliksen; (standing) E. J. Reitler, Paul

F. Rehner and Vasil Georgeff. At right: Vitas Thomas, Fred W. Lucht and M. E. Schneider discuss deep hole drilling developments.

Mrs. T. C. Barber, seated, gives information to Mrs. J. O. Horne, left, and Mrs. Gardner Young.

ASTE Wives Enjoy Exposition Program

The success of ASTE's 1952 exposition and annual meeting meant more than technical sessions and plant tours—members of the ladies' activities committee saw to that. Through their efforts a highly enjoyable five-day program was organized for ASTE wives visiting in Chicago.

Perhaps the highlight of the week, from the strictly feminine point of view, was the luncheon and fashion show staged at Marshall Field and Company. Attendance exceeded all expectations and every available bit of space in the Wedgewood Room was utilized for the event.

Toastmistress for the afternoon was Mrs. Marian Miller, chairman of the committtee. Table favors were presented through the courtesy of several local shops. Entertainment was provided by Nan Weimar of Northwestern University.

The fashion show gave visitors an early preview of exclusive Paris gowns for spring and summer.

Serving with Mrs. Miller were: Mrs. G. W. Steinmetz, Mrs. Thomas Barber, Mrs. Anton J. Schwister, Mrs. Clifford Ives, Mrs. Walter W. Haskins, Mrs. F. J. Schmitt, Mrs. Jerry Tennenbaum, Mrs. E. W. Ostrum, Mrs. Benjamin Fleury, Jr., Mrs. A. L. Winkler.

Other members of the committee include: Mrs. C. C. Waldo, Mrs. G. J. Benes, Mrs. F. A. Leone, Mrs. A. H. Ettinger, Mrs. Clare Bryan, Mrs. Carl E. Schmitz, Mrs. Irving A. Laity, Mrs. A. W. Grove, Mrs. David McDonald and Mrs. H. V. Leoppert.

Above: A portion of the crowd that filled the Wedgewood Room for Marshall Field's fashion show. Upper right: Mrs. Marian Miller, committee chairman, opens the afternoon's program. Lower right: Mrs. Joseph E. Crosby and Mrs. Roger F. Waindle were among the nearly 200 ASTE wives who attended the luncheon at Field's.

allas Selected for outh West Area Meeting

Organizational plans are in full swing for ASTE's South West Area Meeting to be held May 30-31 at Dallas, Texas. Members from ten other chapters—Houston, New Orleans, North Texas, Wichita, Kansas City, Denver, Tulsa, Los Alamos, Albuquerque and Salt Lake City—will participate in the two-day event.

Although Dallas members are acting as business agents for the meeting, all chapters are sharing in the planning and arrangements.

Featured at the gathering of south west ASTE members will be technical sessions, plant tours, membership meeting, ladies' events, banquet and a social program.

Advance registration is slated to open at five Thursday afternoon, May 29, at the Baker Hotel which has been made area meeting headquarters. A plant tour and technical session on Friday will officially open activities. Visits to an aircraft and a 'non-aircraft' plant are planned.

Aside from the morning technical session, two others will be held after noon. The banquet will take place that evening at seven in the Peacock Terrace.

Saturday's agenda includes the area membership meeting, a panel discussion on metal forming and a tour of an industrial research exhibit.

Programs for visiting ASTE wives are planned for Friday and Saturday and will cover Dallas points of interest.

Committees are being selected to handle details of reception, registration, tour transportation, housing, signs, tickets, sessions arrangements and budgets and records.

New Format, Leaflet Due for ASTE News

Coverage of ASTE news, now being handled in most chapters by new editorial chairmen, will be discussed in a leaflet scheduled for circulation the latter part of April.

The object of the small publication is to help acquaint ASTE editorial chairmen with the production of Society news in THE TOOL ENGINEER. Brief discussions will be included on photographs, feature articles, captions and local publicity. Deadlines and corrections will also be reviewed.

A new format will also be presented for reporting news to the magazine. Designed to cut the time normally needed to write out a news story, the changes in reporting methods and procedures, will, it is hoped, lighten the load of all editorial chairmen.

ASTE Initiates Diamond Standards

Representatives of ASTE and eight other organizations met February 1 in Detroit to study standardization of industrial diamonds.

The roll call included 25 men from the Industrial Diamond Association, National Machine Tool Builders Association, Grinding Wheel Institute, Ford Motor Co. of Canada, Naval Ordnance Plant, Universal Products Co., National Diamond Lab, Inc., and the Joint Industrial Conference. R. C. Peterson, head of ASTE's National Standards Committee, acted as chairman.

A steering committee was named to begin work on standardization of diamond tool holders and their nomenclature.

Serving with Chairman J. C. Brenner, manufacturing engineer, Sperry Gyroscope Co., representing ASTE; are Roger Waindle, director of research at Nugent Sand Co. and first vice president of the Society; K. B. Jackson, research engineer, Buick Motor Co., representing the Joint Industrial Conference; Donald Stone, general manager, J. K. Smit and Sons, representing the Industrial Diamond Association; W. G. Schwartz, president, Crain-Schwartz Diamond Tool Co., representing IDA; D. H. Currie from the Grinding Wheel Institute and sales engineer with Carborundum Co.

Other members are Jerry Krandall, representing IDA and president of the Abrasive Dressing Tool Co.; Gilbert Stewart, chief engineer, machinery div., Ex-Cell-O Corp., and representing the National Machine Tool Builders Association; Robert Koebel, assistant secretary, Koebel Diamond Tool Co. and representing IDA.

C. T. Burke, secretary of ASTE's National Standards Committee is recorder.

This group will compile a list of all machine diamond tool holders as they apply to each machine tool builder. A nomenclature is to be drafted on diamond tool holders.

The steering committee will meet the latter part of May to evaluate the material gathered for presentation to the ASTE National Standards Committee.

The official welcome at the session was extended by L. B. Bellamy, now president of ASTE.

Mr. Brenner outlined in detail the objectives and advantages of standardization of industrial diamonds as it would influence tool engineers, purchasing agents, inspectors and stock controllers.

He said standardization will bring a better knowledge of the technology of diamonds to industry which could thereby select these tools and integrate them more intelligently into production processes.

Mr. Peterson then reviewed the procedures necessary in establishing standards under the auspices of the American Standards Association.

T. I. Phillips Named Staff Vice President

T. I. Phillips, a member of the Pittsburgh ASTE chapter, has been appointed to the position of staff vice president in charge of manufacturing at Westinghouse Electric Corp. He formerly headed the company's East Pittsburgh division.

J. W. Brigham Promoted

John W. Brigham is now general sales manager of Baker Brothers, Inc., Toledo. Mr. Brigham, a member of ASTE, was formerly assistant sales manager and is completing his 27th year with the firm.

Sales Manager Appointed

Announcement has been made by Neff Kohlbusch & Bissell, Inc. of the appointment of F. C. Berger to the position of sales manager. Mr. Berger is a member of the Chicago ASTE chapter. The machine tool distributing firm recently moved their offices to 5700 W. North Ave., Chicago.

16 Chapters Meet Membership Goals

With the total membership of the Society well over the 20,000 mark, 16 chapters have exceeded their membership goals established last spring.

According to figures available March 1, these chapters of ASTE have increased their membership by at least 20 per cent: Twin States, Binghampton, Mid-Hudson, Long Island, Potomac, Peoria, Madison, Jackson, Waterloo Area, Long Beach, Albuquerque, Wichita, Tulsa, Evansville, Akron and Springfield, Ill.

Age Requirements Remain the Same

ASTE members, particularly those not yet 25 years of age, are advised that the age requirements for becoming a senior member of the Society is still set at 25 years.

There has been no change or modification of this ruling, according to national headquarters in Detroit.

Ebelhare Outlines Qualities of Plastics

Poughkeepsie, N. Y. — Technical speaker at the February 12 meeting of the Mid-Hudson chapter was G. A. Ebelhare, manager of the Synthane Corp., Oakes, Pa.

Co-author of a book on fabrication of plastics, Mr. Ebelhare outlined the advantages of laminated plastic—its light weight, excellent insulation, resistance to moisture and absorption and easy machinability. He described how paper and fabrics were bonded with phenol-formaldehyde resins, then pressed between plates and molds to make sheets, rods, tubes and simple molded shapes.

Mr. Ebelhare said that one of the latest uses for laminated plastic is in the manufacture of printed circuits for radio and television where the copper facings are etched out to a complete circuit.

At the business portion of the meeting, the nominating committee presented its slate of officers for the next term of office. L. H. Tenney headed the group.

Elected were Joseph A. Crane, chairman; Stanley P. Cook, first vice chairman; Raymond Lansing, second vice chairman; Jenry T. Tesmer, secretary; Harry N. Carlson, treasurer and William W. Schug, delegate.

Chairman Schug, who presided at the dinner-meeting held at the Nelson House, announced that the chapter had exceeded its membership goal and welcomed the new ASTE members to the chapter.

Featured speaker at the January meeting was Walter R. Buerckel, Nicholson File Co., Providence, R. I. He spoke to more than 45 members on "Manufacture, Metallurgy and Application of Files."

Federal Products Co. Sponsors ASTE Program

Winston-Salem, N. C. — ASTE members of the Piedmont chapter gathered at the Robert E. Lee Hotel on January 14 for dinner and a program on gaging practice and quality control staged by representatives of the Federal Products Co., Providence, R. I.

Principal speaker was C. W. Kennedy, chief engineer at the company, and the discussion leader was Jerry Dreyer, development engineer. The movie "Gaging for Profit" was shown to 75 members and guests at the meeting.

Program arrangements were made by Stanley Longdon, ASTE member and local representative for Federal Products, who also prepared the exhibits for the technical session.

The January panel meeting on new developments in carbides drew a standing-room-only crowd of 339 Philadelphia members and guests to hear four speakers and participate in a lively discussion. Pictured are: John Kennedy, Carboloy Dept., General Electric Co.; Irving Weber, Pittman Dunn Laboratory, Frankford Arsenal; W. L. Kennicott, Kennametal; and M. F. Judkins, Firth-Sterling. Moderator was C. R. Pittsinger.

Award Scholarship to British Columbia Student

Selection of Alan D. Cronk, senior in mechanical engineering at the University of British Columbia, as a winner of one of the five 1951-1952 ASTE scholarships has been announced by the chairman of the Society's National Education Committee.

Alan Cronk

The award, which carries a cash value of $300, is given annually to aid each of five students in their fourth or fifth year of college who are taking subjects coming under the category of tool engineering. Mr. Cronk is the first Canadian to win the award. He was born in Fort William, Ontario, and is now living in Vancouver, British Columbia.

He was employed by Canadian Car and Foundry Co., Noorduyn Aircraft Co., Defense Industries, Ltd., Boeing Aircraft Co., Chisholm Industries before entering the University of British Columbia in 1948.

Eric Nelson Promoted

Eric Nelson, member of the Northern New Jersey ASTE chapter, is now plant superintendent at the Watson-Stillman Co., Roselle, N. J. His appointment was announced by E. A. Stillman, president of the firm.

Sales Manager Retires

William H. White, Detroit ASTE chapter member, has retired as manager of tool steel sales for the Detroit district of Allegheny Ludlum Steel Corp.

Mr. White began his career as a machinist and later became a tool and die maker before entering the sales end of the tool steel industry. He joined the former Atlas Steel Co. as manager of sales of the Cleveland-Ohio district in 1921 and held that position during a series of mergers which absorbed Atlas into Allegheny Ludlum.

Twin States Chapter Tours Bryant Chucking

Springfield, Vt. — A technical program sponsored by Bryant Chucking Grinder Co. and a tour of the plant were featured at the February 13 meeting of the Twin States ASTE chapter.

The history of the firm was given by Merton H. Arms, who supplemented his talk with colored slides and photographs. Allen Brown, advertising manager, narrated a series of films, produced by Bryant, on the grinding of aircraft fuel injection nozzles by use of high-frequency wheel heads.

Ray Fenn, electrical engineer at Bryant, detailed the use and manufacture of these wheel heads which are capable of running at 100,000 RPM and were used extensively during World War II by the aircraft industry because of the ability to hold a tolerance of five millionths of an inch.

troit Engineers ar Carl Demrick

etroit—New officers to serve the roit ASTE chapter for the coming were elected February 14 at a ting held at the Rackham Build- Headed by Chairman Edward D. rd, the slate includes: John Curtis, vice chairman; Michael Pinto, sec- vice chairman; Charles W. Ward, retary; John W. Wagus, treasurer; n D. Anderson, delegate; and Ed- d D. Wiard, alternate delegate.

Carl J. Demrick, supervisor of the tral estimating department of the ysler Corp., was the technical speak- for the evening. He addressed an ience of more than 300 members d guests on the subject "The Pur- sing Engineer's Counsel to the 1952 chine Tool Vendors."

Mr. Demrick said that expansion, in e of current economic problems, may be the answer to productions prob- s of the machine tool industry.

Subcontracting is one method where- one plant does not have to absorb whole new tooling program. Quality n be maintained through adequate spection and control.

New methods of manufacture and w procedures in operations may also lp in increasing output. Better plan- g and scheduling results in greater ordination, an important factor in eeting delivery dates.

areful Selection of achine Tools Stressed

Toronto — "Job Analysis and Equip- ent Selection" was the subject cov- ed by James Meehan, sales director, rown and Sharpe Mfg. Co., at the ebruary meeting of the Toronto hapter.

Mr. Meehan stressed the importance careful selection of machine tools nd demonstrated a unique method of hoosing the right machine by using hat he termed "the analysis tree." It implified the problem by considering he design features of each type of ma- hine capable of performing the oper- tion in relation to the requirements f the job.

The chapter's annual election of of- cers was held at the February meet- g. The new slate includes: Fred Lock- art, chairman; David Few, first vice hairman; Cliff Farr, second vice chair- an; Bruce Fairgrieve, third vice chair- an; Kenneth Laidley, secretary and Eric Brown, treasurer.

A plant tour of the John Inglis Co. as featured at the January meeting. More than 150 members and guests ook advantage of the opportunity to bserve the wide variety of operations t the factory.

Carl J. Demrick

The January meeting was devoted to the annual father and son banquet.

Entertainment included a technicolor movie on tarpon fishing which was narrated by Eddie Wood, national professional dry fly champion, who later demonstrated some of the fundamentals of casting. A program was also presented by the Michigan Bell Telephone Co. About 250 fathers and sons attended the meeting.

Springfield Features Session on Broaching

Springfield, Mass. — Joseph Psenka, field engineer for the National Broach Co., Detroit, was the program speaker at the January 14 meeting of the Springfield ASTE chapter. He gave an illustrated lecture, using colored slides, on broaching various manufactured parts and the manufacture of broaches at his plant. A discussion period followed the technical session.

A coffee talk was made by Richard Brown, technical chairman, who spoke to the chapter on "Egypt Today."

St. Louis Chapter Meets With ASM Members

St. Louis — A joint meeting of the ASTE chapter and members of the ASM attracted more than 150 persons on January 3. The dinner and technical session were held at the DeSoto Hotel.

Speaker of the evening was J. A. Koch, assistant regional manager, Carpenter Steel Co. His talk covered the practical working information necessary in tool engineering to compare values in application of many tool steels falling in the air-hardening classification.

A movie on "The Romance of Aluminum" was shown before the session got underway.

William W. Schug, general sales manager, V & O Press Co., was guest speaker at the February meeting. He spoke on "Presses Geared for Automatic Production."

Modern Inspection and Gaging Methods Reviewed

London, Ont. — Nearly 100 members of the London-St. Thomas chapter attended the January dinner meeting which was held at the Cobblestone Inn. Chairman A. H. Ward presided.

Walter Appleton of the Brown and Sharpe Mfg. Co. and past chairman of the Toronto ASTE chapter was technical speaker. He was introduced by George Baker.

Mr. Appleton showed a film and slides to illustrate the progress man has made since the early days of gaging and spoke to the chapter on "Modern Inspection and Gaging Methods."

A carbine-tipped micrometer from Brown and Sharpe was awarded to Ted Mantz at the close of the meeting.

Other News in This Issue

Metallurgist Speaks at Cedar Rapids Meeting

Cedar Rapids — "Machining of Metals" was the technical topic discussed at the February meeting of Cedar Rapids ASTE members held at the Hotel Montrose. Speaker for the evening was Elbert A. Hoffman, manager metallurgical sales department, LaSalle Steel Corp., Chicago.

The coffee talk was given by Gus Schrader, sports editor of the *Cedar Rapids Gazette*, who spoke on University of Iowa and Big Ten athletics.

The ballot box was passed during the business portion of the meeting and the following officers were elected for the coming year: Edwin F. Klouda, chairman; Richard L. Coyner, first vice chairman; Carroll F. Bryant, second vice chairman; Elmer M. Bruce, secretary; and Frank J. Jekerle, treasurer.

Mr. Hoffman said that since the object of all machining is the production of chips, the study of machining could best be a study of chips and chip formation. He described the three types of chips as continuous, discontinuous and discontinuous with built-up edges. The characteristics of these different chips were illustrated by photomicrographs of tools making cuts and a model.

Types of tool failure were related to chip types, structure and work hardenability of the workpiece. The effects of these variables as well as speeds, feeds, coolants and rake angles were related by means of graphs to tool life, cutting forces and heat distribution in tool, chips and workpiece.

At the January meeting the chapter was host to Cedar Rapids members of ASM and the student section of ASME at Iowa State University. An audience of 142 members heard Dr. A. M. Lippisch, director of Collins Aeronautical Research laboratory, Collins Radio Co., discuss "Jet Engines and Jet Planes." A buffet dinner preceded the technical session.

Dr. Lippisch told of his role in the development of rockets and jet propulsion from 1928 when he headed a glider institute near Vienna through World War II, and when he helped perfect a tailless plane for the Messerschmitt works in Germany to his present-day activities in this country.

Congratulations were very much in order at the February 8 meeting of the Cleveland ASTE chapter. Andrew Clark (right) receives the best wishes of L. B. Bellamy on his election to the chairmanship of the chapter. Other officers elected at the meeting are First Vice Chairman Gordon W. Carlton, Second Vice Chairman Harold J. Hausrath, Secretary Charles Christy and Treasurer Andrew B. Cirbus.

Waindle Addresses Omaha Engineers

Omaha—"Establishment of an AS chapter in Omaha would be a spur industrial growth," Roger F. Wain said February 21 at a meeting of nea 40 engineers and manufacturing ex utives held at the Fontonelle Hotel. T ASTE national officer said that the e couragement of the basic industry tool making—brings other industries.

Speaking on the present machine to situation, Mr. Waindle stated that t machine tool bottleneck plaguing t nation's manufacturers has mostly d appeared because of the cutback in d fense production. Most machine too now can be delivered in from four six months although in some cases t backlog remains at about two years.

Pittsburgh Chapter Headed by Fred Hennig

Pittsburgh — Officers for 1953 were named in an election held at th February meeting of Pittsburgh AST members. They are: Fred Henni chairman; L. J. Brozek, first vice cha man; R. S. Mason, second vice cha man, Elwood W. Weissert, secreta and Frank Glenn, treasurer.

The role radio active isotopes a playing in medical research was co ered in the technical session by Dr Creutz, who is in charge of the ne Carnegie Tech cyclotron. He spoke o atomic power and told of many indu trial applications for nucleur physic

The carbide panel discussion a tracted 150 members to the Januar meeting held at the Sheraton Hote Participating in the program were H H. Jason, Edward Gamble, F. A. Ma tin, R. A. McLaughlin, M. L. Back strom, John Grey and W. L. Kennicott Some of the topics covered were braze on tips, mechanically help tips, chi breakers, proper feeds and speeds fo various materials and application, limi tation and substitutions in carbid tools.

275 Members, Guests Attend Montreal Session

Montreal, Que. — An audience o 275 members and guests of Montreal ASTE chapter was on hand February 14 at the Montreal Technical Schoo to hear an address by Robert Weisbeck Wales-Strippit Corp. He spoke o "Modern Methods of Punching and Notching."

Mr. Weisbeck emphasized the im portance of die clearance and said the sides of the punch should be smooth ground, if possible. A slight taper starting at the cutting edge, aids in reducing stripping difficulties. Refresh ments were served, courtesy of The Wales-Strippit Corp., after the meeting.

...views Inspection by ...tical Projection

...terboro, Ont.— Edward C. Polidor, ...f engineer, Engineers Specialties ...sion, Buffalo, N. Y., was the guest ...ker at the February meeting of the ...erboro District chapter of ASTE. ...spoke to nearly 100 members and ...sts on "Gage Inspection by Optical ...jection Methods."

...Mr. Polidor emphasized the advan...es in using this type of inspection— ...reduction in the task of training ...building up gage-making person... ...decrease in the initial cost of gages, ...duction in time requirements for pro...ction gaging and the elimination, to ...arge extent, of the problem of train... ...personnel in the use of gages.

...Speaker at the January 15 meeting ...s H. Archie Smith of the Union ...reen Plate Co. of Canada. He related ...brief history of the firm and dis...ssed two phases of electroplating, one ...orative and the other industrial ...ctroplating.

...The latter is becoming more predom...ant in its usefulness and produces ...ch characteristics as corrosive re...stance, wear resistance and a variety ...surface finishes which can be ap...ied wherever desired. Slides were ...ed for illustration.

...The 50 members present for the meet...g were served a luncheon after the ...ose of the technical session.

Earl Tesmer Wins Membership Award

Seattle — Several guests were hon...ed at the January 22 meeting of Seattle ASTE members. THE TOOL ENGINEER's Andy Rylander received a special welcome as did Leslie Hawes, Ben Hazewinkel and Art Lewis.

Earl Tesmer was awarded a *Tool Engineers Handbook* at the meeting in appreciation of his efforts in getting the most new members in the current membership campaign.

The process of metal spinning was the subject of technical speaker E. L. Tollefsen of the Boeing Airplane Co. Spinning parts for the aircraft industry was stressed and particular mention was made of the characteristics of metals when spun.

A. M. Brown Joins Lamson

Angus M. Brown has been appointed to the position of manager of commercial sales with the Lamson Corp., Syracuse, N. Y. An ASTE member and a contributor to the *Tool Engineers Handbook*, Mr. Brown was previously associated with Divine Bros., Utica, N. Y., where he served in the operations, plant engineering, and market research departments.

Officers elected at the February meeting of the Peterboro chapter are (back row, from left): Third Vice Chairman Jack Graham, Treasurer Gordon Wainwright, Second Vice Chairman Gordon Page, Secretary Earle Wellman. Seated: First Vice Chairman Len Hansler, Chairman Robert Dyer and E. C. Polidor and Mr. Manning, program speakers.

Army Officer Discusses Procurement Problems

Bridgeport, Conn. — "Possibilities and Limitations of Cold Roll Forming" was the technical topic discussed at the January 2 meeting of the Fairfield County chapter of ASTE. Speaker was Elmer J. Vanderplaeg, assistant chief engineer, Yoder Co., Cleveland, who has had 25 years of experience in supervising and designing machines and rolls for cold roll forming.

The coffee talk was presented by Lt. Col. Calvin B. Banigan, executive officer of the Springfield Ordnance District. A graduate of the University of Nevada and George Washington University, Col. Banigan spoke on "Current Problems of Procurement."

Talks on Carbide Milling

Newark — L. H. Goddard, vice president in charge of engineering at Goddard and Goddard Co., was the technical speaker at the January meeting of the Newark ASTE chapter. He addressed more than 150 members and their guests on the subject "Carbide Milling."

Appointed Chief Engineer

E. Y. Seborg has been promoted to the position of chief engineer of the Barnes Drill Co., Rockford, Ill. Mr. Seborg, an active member and past chairman of the Rockford ASTE chapter, was a session chairman at the annual meeting held in Chicago last month.

D. R. Weedon Addresses Worcester Chapter

Worcester, Mass. — D. R. Weedon, assistant manager of the Blanchard Machine Co., was the technical speaker at the dinner meeting of Worcester's ASTE chapter held February 5 at Putname and Thurston's. His subject was "Grinding Flat Surfaces" in which he described the various types of work applicable to the Blanchard line of grinders.

Mr. Weedon's talk was followed by slides showing various applications. Leon S. Kinsman, sales engineer for the firm, served as narrator during the showing of the slides.

The coffee speaker was Jerome W. Howe, dean of Worcester Polytechnic Institute, who spoke on scholarships and the part they play in providing higher education to young men interested in engineering. He pointed out that bequests formerly made up the largest share of help in providing scholarships but in the future, because of the lack of new grants, industry will be called upon to give more and more of this help to further engineering.

At a short business meeting a slate of officers was presented by Carroll Morse of the nominating committee. Elected to serve for 1952-53 were E. Roland Ljungquist, chairman; John E. Rotchford, first vice chairman; John N. Engelsted, second vice chairman; Louis J. Furman, secretary; Adam T. Kusciusko, treasurer, Ralph A. Baker, delegate; Ralph A. Rawlings, alternate.

More than 125 members of the chapter heard Glen H. Stimson speak on "Tapping and Threading" at a dinner meeting held January 8 at the Hickory House. Mr. Stimson, chief engineer, Gage Div., Greenfield Tap and Die Corp., told of the development of the unified screw thread system and its importance to industry and pointed out the economic savings in tooling and gaging with the adoption of this system.

Albert Johnson, sales engineer at Greenfield, narrated a showing of slides on drill nomenclature and use.

William L. Clarke New Chapter Chairman

Buffalo—February 14 was election night for members of the Buffalo-Niagara Frontier chapter who selected a slate of officers for 1952-53.

William L. Clarke is the new chapter chairman. Others elected to office are: William J. Iekel, first vice chairman; Charles F. Oliver, second vice chairman; Harvey W. Ellis, secretary; and Robert F. Slate, treasurer.

After the business session, some 65 members and guests heard a talk on simplified drafting given by W. L. Healy, supervisor of technical services at General Electric's Switch Gear plant in Philadelphia. He defined his topic as "drafting stripped of all its frills, yet surrendering nothing in either clarity of presentation or accuracy of dimension."

The program was supplemented by slides, showing part delineation by the conventional method as compared with the simplified method.

Hold Joint ASTE and Quality Control Meeting

Muncie, Ind. — The second annual joint meeting of ASTE members and the Muncie Section for Quality Control was held February 5. The technical session and dinner were held at the Delaware Hotel.

Speaker of the evening was Clifford W. Kennedy, quality control research engineer, Federal Products Corp., Providence, R. I., who spoke on the topic, "Putting Quality Control to Work."

The $200 scholarship of the Toledo chapter was presented to Donald Christensen on January 9 by Harry Nordgren, education chairman. Mr. Christensen is a senior engineering student at the University of Toledo. Dr. Asa S. Knowles, president of the university, was the principal speaker at the meeting.

Committee Sponsors Classes in Hydraulics

Poughkeepsie, N. Y.—The educational committee of the Mid-Hudson chapter of the Society recently completed a presentation of eight weekly lectures on "Hydraulics for Tool Design." The class of 47 students was limited to ASTE members since the expense of the education program was paid for by the Mid-Hudson chapter.

Dr. Glen N. Cox, professor of hydraulics and mechanics at New York University and author of a text on *Fluid Mechanics*, was selected to instruct the class by the education committee, headed by John L. Petz.

Peoria's ASTE members held their annual election of officers at the February 5 meeting. Nearly 200 were present for the balloting. The new chairmen and officers are pictured below. Seated (from left): Donald Hartter, first vice chairman; W. H. Logue, chairman; Victor Schellschmidt, second vice chairman. Standing: D. H. Brighton, past chairman and delegate; Walter Ballard, secretary, and Jennings V. Jucker, treasurer.

Outlines Development of Unified Screw Threads

Keene, N. H. — ASTE members of the Keene co-chapter, an affiliate of the Twin States group, held the January dinner meeting at the Masonic Temple.

Membership pins were presented by Floyd McArthur to Charles P. Hall, William H. Lenney and Robert E. Paddock.

Glen H. Stinson, chief engineer, Gage Div., Greenfield Tap & Die Corp., spoke to an audience of 50 members and guests on the subject, "Development of Unified Screw Threads and Their Importance to Industry." He was assisted by James Ballou, tool engineer at Greenfield. The slide lecture consisted of graphically illustrated tolerances the errors which may exist in screw threads and gaging procedures to be used to check them. A question and answer period was included in the session.

A brief talk on the activities of the Monadnock Region Assoc. was delivered by the group's executive secretary, Daniel F. Eneguess, Jr.

Kansas City Members Name 1952-53 Officers

Kansas City, Mo. — More than 100 members and guests attended the February technical session and election of officers held at Roselli's Restaurant. New chairman of the chapter is John Hoover. Other officers named are John T. Needham, first vice chairman; Melvin Grundy, second vice chairman; Harold W. Buddenbohm, secretary and Gary J. Schroer, treasurer.

Earl P. Leeds, director of sales, Brown and Sharpe Mfg. Co., was the featured speaker. His discussion on "The Efficient Application of Special Fixtures on Standard Milling Machines" was illustrated with slides and movies.

ASTE members heard L. W. Golden, manager of the precision casting section, Material Engineering Dept. at Westinghouse speak at the January meeting. "The Manufacturing of Castings" was his topic.

The major portion of Mr. Golden's talk was devoted to the 'lost wax' process in the manufacture of turbine blades. Slides were used to show operations necessary in making the master pattern, molds for the wax patterns, and the ceramic type of mold for the casting.

Mr. Golden also discussed the newly-developed shell type of casting wherein sand and a plastic resin are used to form a mold for casting. A number of castings made by the two processes were displayed by the speaker who conducted a question and answer period after the program.

The annual Ladies' Night program, including dinner and dancing, was held by Evansville members on January 9. More than 125 members and guests attended. Frank Wallace (second from left), of the Indian department of conservation, was the featured speaker. With him are John Race, Charles Thuman and Henry Pernicka.

Chicago ASTE Chapter Elects New Officers

Chicago—H. Verne Loeppert was elected chairman of the Chicago ASTE chapter at the February 12 meeting held at the Graemere Hotel. Other officers serving for 1952-53 are: Harry A. Paine, first vice chairman; John H. Beck, second vice chairman; Howard Ettinger, third vice chairman; Gordon J. Benes, secretary; and Joseph J. Kayda, treasurer.

The January meeting included a short business session and a technical session devoted to "Automatic Transfer Type Machine Tools." Program speaker was Judd H. Mansfield, chief engineer of Greenlee Bros. & Co., Rockford, Ill.

He traced the development of these machines from 1935, when Greenlee built its first up to the present day, emphasizing that they are best suited for such operations as drilling, reaming, counter-boring, tapping and milling. Two sound films were shown picturing procedures on the Greenlee test floor and illustrating the methods of work-holding, locating, control of feeds and speeds.

Moves to New Address

The firm of Tools, Inc. in Philadelphia is now occupying its new quarters at 86 Bethlehem Pike. ASTE members associated with the company are A. R. Diamond, H. Bradley Eastman and Edmund Hollingsworth.

Harry Conn Reviews Tapping Problems

Grand Rapids, Mich. — Various tapping problems found in all fields of industry were covered at the January meeting of the Western Michigan chapter of the Society.

Speaker of the evening was Harry Conn, who is chief engineer at Scully-Jones and Co., Chicago. The technical session was preceded by a dinner and business meeting attended by 45 members and guests at the Elks Club.

Hamilton Chapter Holds Members' Night

Brantford, Ont.—Members' Night and the annual election of officers were held February 14 at the Brant Hotel by the Hamilton District chapter.

William M. Shaw is the new chairman and the other men serving for the coming year are Clarence E. Bulmer, first vice chairman; John Snyder, second vice chairman; Frank Johnson, third vice chairman; H. B. Ward, secretary; Robert Hall, treasurer, John Yorick, delegate and John Walton, alternate.

Technical speakers were George Dennis, Canadian Carborundum Co., who spoke on the various uses of grinding wheels, and William Durrant of Pratt & Whitney, who spoke on the unified thread standard.

At the January meeting, Otto R. Hills, chief engineer of the W. T. Gibson Co., Chicago, covered the various types of springs and their uses.

Pontiac Members Hear Army Officers

Pontiac, Mich. — Executive Secretary Harry E. Conrad was among the honored guests at the January meeting of the Pontiac ASTE chapter. Speakers at the technical session were Capt. R. H. Cashman, USAF, who is in charge of the jet engine program at the Buick Motor Co., and Maj. John T. McGowan, small business contract officer, Detroit office, Air Force Procurement Bureau.

In his talk on "The Coordination of Design and Production," Capt. Cashman said that the tool engineer can and must exercise his technical background to prevent an inexperienced designer from creating a white elephant.

"Each tool engineer must sell himself and his profession to top management so he is present during the initial design stages and can recommend changes that will facilitate manufacturing," Capt. Cashman said. He later explained the Air Force organization and told how contracts were awarded to various contractors in each area, emphasizing that the various offices of the Air Force are open at all times to help any business either procure contracts or advise them as to policies.

Maj. McGowan's talk dealt entirely with the small business man and his problems relative to procuring government contracts. Recognizing the fact that the transition of going from a curtailed civilian economy to an expanded defense program has created an adverse effect on small business, he said, "A program is now in effect that will bring much needed assistance and advice to the small business man's back door. All available information on defense contracts can be obtained at the Michigan Dept. of Economic Development."

A question and answer period afforded the business representatives present the opportunity to quiz the officers on their own particular problems.

Getchall Addresses Tulsa ASTE Chapter

Tulsa — ASTE members heard Warren D. Getchall, chief field engineer of the McCrosky Tool Corp., at the January meeting of the Tulsa chapter. The topic for the technical session was "The Overall Economics of Metal Cutting as Applied to Milling."

Mr. Getchall covered the selection of metals in the design of milling cutters, the actual design operation, speeds and feeds and care and sharpening. Movies were used for illustration.

The meeting was held at Lorton Hall Auditorium on the campus of Tulsa University.

Woodall Engineer Speaks in Columbus

Columbus — "Inspection by Optical Projection" was William De Boer's subject when he spoke before ASTE members in Columbus at their regular meeting February 13. The dinner and technical session were held at the Fort Hayes Hotel. Mr. De Boer is an engineer in the specialities division of the Woodall Engineering and Sales Co., Dayton.

At the ASTE January meeting, F. W. Boulger, supervisory metallurgist in steel processing research at Battelle Institute, spoke on "Machinability Measurements on Constant-Pressure Lathes." Mr. Boulger's talk was based on data he had compiled from research sponsored by various steel manufacturers interested in developing methods to determine more accurately the machinability of metals.

He said that a set-up using a constant-pressure lathe is an accurate and reliable method in detecting differences in machinability between grades and between steels of the same grade.

Constant-pressure machinability tests can be made with a lathe and simple auxiliary equipment. The performance of a metal in tests so conducted is related principally to the frictional properties of the metal.

Joseph Aprile Fills Chairman's Position

Cincinnati — A capacity crowd of 450 members and guests attended the annual ASTE dinner dance held on February 9. The party was held in the Marie Antoinette ballroom of the Alms Hotel.

The technical session held February 12 at the Engineering Society featured Kenneth N. Macomber, chief service engineer of the LaPointe Machine Tool Co. He spoke on "Tooling for Jet Engines."

New officers of the chapter elected in February are: Joseph Aprile, chairman; Richard Niebusch, first vice chairman; Joseph Maezer, second vice chairman; Walter DeRoche, secretary and Frank Heap, treasurer.

Engineers Review Multiple Slide Presses

New Haven, Conn. — "Tooling for Multiple Slide Presses" was the subject discussed at the February 14 meeting held by ASTE members at the Hotel Garde. Andrew Melnick and R. A. Creighton, chief engineer and field engineer, respectively, with the U. S. Tool Co. were the speakers. About 75 members and guests attended the technical session and informal dinner.

Dr. Edward Orban (right) of the Mound Laboratory, Monsanto Chemical Co., was the featured speaker at the January meeting of the Ft. Wayne chapter. About 50 members heard his address on atomic research. Pictured with him is Ralph Didier.

Research Director Named

Thur Schmidt has been appointed director of research and development of Ingersoll Products Div., Borg-Warner Corp. in Chicago. He will be in charge of the development of new manufacturing processes, products and markets.

A member of the Chicago ASTE chapter, Mr. Schmidt formerly held the position of assistant to the president.

Bellamy Featured Speaker at Milwaukee Meeting

Milwaukee — L. B. Bellamy, Detroit district manager of Sterling Grinding Wheel Division of Cleveland Quarries Co., was the main speaker at the February 14 meeting of Milwaukee's ASTE chapter held at the Elks Club. He spoke on "Grinding Wheels and the Tool Engineer."

Coffee speaker on the program was A. J. Schneider, general sales manager of Sterling Grinding Wheel Division and a member of the board of directors of the Grinding Wheel Institute. His subject was "The Grinding Wheel."

A dinner dance was held on January 26 by Milwaukee members. Steaks were featured on the menu, a short floor show highlighted the entertainment and dancing to the music of Frankie Rauch's orchestra completed the evening's program.

Klonowski Talks on Punching Problems

Galt, Ont. — J. Edmund Klonowski of the Pivot Punch & Die Corp., North Tonawanda, N. Y., was the technical speaker at a meeting of the Grand River Valley chapter on January 4. More than 80 members attended the session.

Mr. Klonowski spoke on "Punching Problems" and movies were shown to illustrate his lecture. A buffet supper was served following the formal part of the program.

OBITUARIES

William H. Oldacre

William H. Oldacre, president and general manager of the D. A. Stuart Oil Co., died on January 18. Associated with the Chicago firm for almost 32 years, he had been director of research before becoming president.

Previous engineering experience with General Electric Co. and Timken Roller Bearing Co. introduced Mr. Oldacre to the oil business.

He had published many papers on cutting fluids and metal-working problems.

He had been national president of the National Lubricating Grease Institute and the first chairman of the Coordinating Research Council. He was a member of the Chicago chapter of ASTE, Society of Automotive Engineers, American Petroleum Institute, American Society of Mechancal Engineers, American Society for Testing Metals, American Society for Metals, American Chemical Society and Association of Iron and Steel Engineers.

James R. Fuller

James R. Fuller, a steel broker for 35 years and member of the Pittsburgh ASTE chapter, died on December 29.

Formerly with the Pittsburgh-Des Moines Steel Co., Mr. Fuller became an independent steel broker in 1916. He was a graduate of the Carnegie Institute of Technology.

Oscar A. Knight

Oscar A. Knight, 72, retired Detroit district manager, Grinding Machine Div. of the Norton Co., died December 17 at his home in Royal Oak, Mich.

After joining Norton in 1905, Mr. Knight was specially trained as a grinding demonstrator by Charles E. Norton, father of cylindrical grinding. He became a special representative and was named Detroit manager in 1920. He retired in 1945.

Mr. Knight was a charter member of the Detroit chapter of the Society and a member of the Engineering Society of Detroit.

Major item on the February program for Los Angeles ASTE members was the election of officers for the coming year. Shown here (from left) are Chairman Ralph Crissie, First Vice Chairman Carl Almquist, Second Vice Chairman Eddie Riddle, Secretary Frank Bale, Treasurer Paul Slater, Delegate Wayne Ewing and Alternate Delegate Anton Peck.

rville Strahm Elected Wichita Chairman

Wichita — More than 100 members nd guests of the Wichita chapter met ebruary 13 to hear Earl P. Leeds, irector of Brown and Sharpe milling achine sales, discuss "Efficient Apication of Special Fixtures on Standd Milling Machines."

New officers for the coming year ere elected at the meeting. Serving e chapter are: Orville B. Strahm, hairman; Harold Bales, first vice hairman; A. A. Reddy, second vice hairman; R. O. White, secretary and ames H. Janson, treasurer.

In his lecture, Mr. Leeds said, "The esponsibility of the tool engineer is o reduce the time required for loading nd positioning of work." He described he various types of fixture and holding locks and illustrated the advantages f using cams and formers to achieve igh speed milling.

Mr. Leeds showed shuttle-type mill-ng and the use of block, bridge, roll-er and oscillating milling fixtures. Slides and movies were shown for il-ustration.

The January meeting was attended y 85 members and guests who heard Dr. Stewart G. Fletcher, chief metal-urgist at Latrobe Electric Steel Co., nd Dudley Lewis, regional sales anager for the firm, conduct a rogram on "Selecting & Heat Treat-ng Tool and Die Steels."

Their discussion was followed by the howing of a sound and color film on "The Making of Tool Steel."

Serves on NPA Committee

Ronald J. Ahern, president of The Billings & Spencer Co., Hartford, Conn., as been named to the Drop Forging ndustry Advisory Committee of the National Production Authority.

Mr. Ahern is one of 14 executives of he drop forging industries serving on he committee. He is a member of he ASTE chapter in Hartford.

K. P. Martin Describes New Hydraulic Press

Batavia, Ill. — K. P. Martin, assistant manager of the machinery division at Cincinnati Milling and Grinding Machine Co., was the technical speaker at the January meeting of the Fox River Valley ASTE chapter. The program and dinner were held at the Baker Hotel.

Mr. Martin, who is in charge of the hydro-form program at Cincinnati, told Society members about the new hydro-form machine which is specially designed type of hydraulic press for shaping simple and intricate forms in all kinds of sheet metal with a minimum of operations and with simple tools.

Slides were used to illustrate how the new machine utilizes principles of deep drawing and eliminates the need for matching complicated dies.

Boston Members Hear Lectures on Grinding

Boston—More than 100 members of the Boston ASTE chapter met January 10 to hear John C. Wilson, chief engineer and sales manager, Thompson Grinder Co., speak on contour grinding with crush formed wheels.

Movies and slides on formed grinding, precision contour grinding and generated grinding were shown by the speaker who described the difference between diamond dressed wheels and crush formed wheels for grinding.

David Curry, sales manager, Carborundum Co., discussed the different types of grinding wheels for form grinding. He pointed out that the selection of the proper grinding wheel for a particular job was of paramount importance if the wheel was expected to remove stock at maximum efficiency.

Charles H. Davis acted as technical chairman for the evening.

The name of Edwin L. Beckwith, president of Victory Plastics, Hudson, Mass., has been added to the list of affiliated members of the Boston chapter.

At the December meeting, the president of Rack Engineering and Mfg. Corp., spoke on mechanized transportation of manufacturing supplies and modern storage principles. He stressed that the loading diagram principle was playing a large part in the smooth running plants of today.

"Present methods of stacking tote boxes," Mr. Saul explained, "conserve space and eliminate bins and numerous transfer of materials."

ASTE members of the Twin City chapter toured the Farwell Metal Fabricating Division of Farwell, Ozmun & Kirk Co. on January 9. Shown here are Arthur Stockwell, Donald Reiner, P. W. Armstrong, Harold Sullivan, Jerome Schwartz, Robert Johnson and Peter Tobias inspecting machining operations. G. B. Marzolf is the tour guide.

Unique Tooling Methods Illustrated on Film

Hartford, Conn. — A movie demonstration on unique tooling of forming, drawing and piercing operations on automatic presses supplemented a lecture by William W. Schug, general sales manager, V & O Press Co., a division of Emhart Mfg. Co., at the January 7 meeting of the Hartford ASTE chapter. Dinner at the City Club preceded the technical session which was held in the auditorium of the Gas Co.

Hartford's unusual plan of following a meeting with a more detailed and extensive discussion of the technical subject at another session was again put into effect in January. A four-man panel discussion, sponsored by the technical activities committee, was held January 14 at the plant of Henry & Wright Div., Emhart Mfg. Co.

Participating were Cortis F. Sherman, sales manager, Henry & Wright; Herbert F. Jahn, president, B. Jahn Mfg. Co., New Britain; Jeremiah J. Faziole, chief tool engineer, Bush Mfg. Co., West Hartford and Henry J. Anthony, plant superintendent, Whitney Chain Mfg. Co., Hartford.

Dayton Technical Program Devoted to Small Dies

Dayton — A large crowd of 150 ASTE members and their guests was on hand for the technical program sponsored January 14 by the National Cash Register Co. The entire meeting, including dinner, was held in the company's Oval Room.

The technical session was devoted to "Design and Maintenance of Small Dies as Practiced by National Cash Register Co." Speakers were A. C. Good and Edward Bechtolt, both assistant chief tool designers. Films were shown illustrating the special untra-high-speed technique developed by National Cash Register for studying die machine function and failure.

The group was welcomed by E. W. Cochran, assistant factory manager.

New Post for Guy Hubbard

Guy Hubbard is now associated with Bryant Machinery & Engineering Co., Chicago, as assistant general sales manager. His responsibilities include advertising, publicity and sales promotion activities.

For the past 13 years Mr. Hubbard has been technical editor for the Penton Publishing Co., Cleveland, and machine tool editor of *Steel* magazine. His experience in the machine tool industry also includes machine tool design, sales promotion and advertising with the National Acme Co.

Coming MEETINGS

BOSTON—April 10. Subjects: "Grinding Flat Surfaces" and "Application of Optical Flats." Speakers: D. R. Weedon, assistant manager, Blanchard Machine Co., Cambridge, Mass., and Frank D. Clark, Van Keuren Co., Boston, Mass.

BUFFALO-NIAGARA FRONTIER—April 10, 8 p.m., Plant tour, Stamping Div., Ford Motor Co.

CEDAR RAPIDS—April 16. Plant tour, Pioneer-Central Div., Bendix Aviation Corp., Davenport.

CLEVELAND—April 11, Cleveland Turners. Ladies' Night.

DETROIT—April 10, plant tour. Carbide Section: April 3, "Die Designing Blanks." May 1, "Machine Tooling with Carbide." Student Section: April 17, plant tour.

FOX RIVER VALLEY—April 1. Subject: "Fluid Power in Action." Speaker: H. L. Stewart, Logansport Machine Co., Inc., Logansport, Ind.

GRAND RIVER VALLEY—April 4. Subject: "Cobalt and Its Industrial Applications." Speaker: Carl F. Whittemore, chief metallurgist, Deloro Smelting & Refining Co.

GRANITE STATE—April 8. Subject: "What's New in Cutting Tools." Speaker: William R. Frazer, Union Twist Drill Co., Athol, Mass.

GREATER LANCASTER—April 23. Subject: "Steel With 1,000 Qualities." Speaker: John W. Juppenlatz, chief metallurgist, Lebanon Steel Foundry, Lebanon, Pa.

HAMILTON DISTRICT—April 24, 7 p.m., Burgandy Room, Fischer's Hotel, Ladies' Night, dinner dance.

LEHIGH VALLEY—April 25. Subject: "Design Features and Tooling of Automatic Chucking Machines." Speaker: Mr. Scofield, chief engineer, Potter & Johnston Corp., Pawtucket, R. I.

LOS ANGELES—April 10, plant tour, AiResearch Mfg. Co.

MONTREAL—April 10, 7:45 p.m., Canadian Legion Hall. Subject: "Cutting Lubricants." Speaker: McKinnon Rice, sales technician, Quaker Co.

NEW HAVEN—April 10. Subject: "Screw Machines." Presented by Brown & Sharpe.

PITTSBURGH—April 4, Ladies' Night.

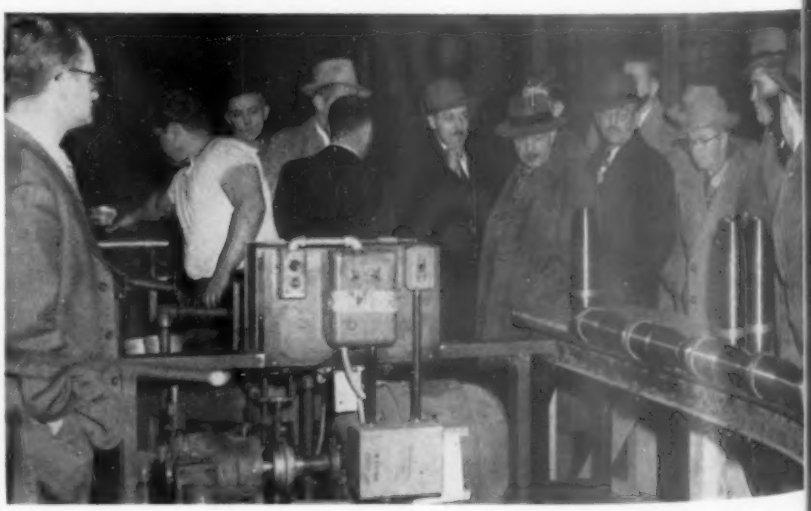
SEATTLE—April 22. Subject: Fabrication, Use and Reconditioning of Carbide Tools." Speaker: A. R. Conti, Carbide Tool Co., Detroit.

TULSA—April 10. Program presented by Frank J. Staroba, manager, Midwestern Dist., Carboloy Dept., General Electric Co.

TWIN STATES—April 9. Subject: "Induction Heading." Speaker: Dr. Harry B. Osborn, Jr., Technical Director, Tocco Div., Ohio Crankshaft Co., Cleveland.

WORCESTER—April 1. Subject: "Generation of Metallic Bearing Surfaces." Speaker: Douglas T. Peden, chief research engineer, Micromatic Hone Corp., Detroit.

Cleveland's ASTE members turned out 200 strong for the January 11 meeting of the chapter held at the Yoder Co. A plant tour of the firm provided members and their guests the opportunity to inspect the manufacture and operation of Yoder's tube-making equipment. The welcome address was delivered by John Lucas, president of the company.



Caterpillar Tractor Co. Promotes Six Members

Six members of the Peoria ASTE chapter have received new assignments with the Caterpillar Tractor Co.

William Naumann was made general factory manager of the earthmoving equipment plant at Joliet. Gordon Swardenski succeeds Mr. Naumann as assistant general factory manager at the Peoria plant.

Harold Schafer was made manager of the planning and tooling division and Hans Erich was named assistant factory manager of Building HH at the Peoria plant.

William G. Thannert was appointed general factory manager of the newly-acquired Traxcavator Division at Milwaukee. Robert Kolb, assistant chief tool designer, succeeds Mr. Thannert as general superintendent of the planning division.

Leon Laux Heads Baltimore Chapter

Baltimore—Officers for the coming year were elected February 9 by members of the Baltimore ASTE chapter. Voted into office were: Leon Laux, chairman; Donald Wernz, first vice chairman; Joseph Antonelli, second vice chairman; Richard Coleman, secretary; Herbert Middlistadt, treasurer; John W. Schukraft, delegate; and Leon Laux, alternate.

The technical speaker, J. Y. Riedel, Bethlehem Steel Co. metallurgist, presented a talk on "Tool Steel Failures." He cited the importance of good design and proper heat treatment for long life in tool steels. Operations at Bethlehem were covered in a movie which showed the mining and processing of raw materials, conversion into ingots, bars, sheet and rolled stock, and eventual usage by the construction and shipbuilding industries.

"Air Power Is Peace Power," an Eastern Airlines film outlining the many steps necessary in aircraft fabrication, was shown before the technical session.

Mountain Climber Tells of Adventures

Elmira, N.Y. — An informal program was featured at the January 7 meeting of the Elmira chapter held at the Mark Twain Hotel. Fifty ASTE members and their guests attended.

Jeff Heath, veteran mountain climber and explorer, described his adventures during the past 12 years climbing mountains in various countries of the world. His talk was illustrated by slides.

Dinner was served before the program and a social hour concluded the evening's entertainment.

West Coast News

By Andrew E. Rylander

What with attending meetings in the Bay Area and the Northwest, this report will cover considerable territory. At the meeting of Golden Gate chapter, January 16, Minnesota Mining & Mfg. Co., presented a movie on belt abrasives that should have wider showing. It's good! I was there too, with a talk on "Plant Layout," but in view of the lateness of the hour and restlessness occasioned by worry over flooded roads, threw her into high and so got the boys on their way before curfew struck.

January 17, took a plane to Portland. A beautiful trip, with snow-crowned mountains rearing their heads above the clouds. In my belief, the city has excellent potentials for ASTE membership although the local chapter needs some big-brotherly help during a trying period. All for one and one for all, y'know.

While attendance at the Portland meeting left much to be desired, it provided opportunity for a round-table discussion of ways and means directed toward chapter growth. In this discussion, Art Lewis—among visitors—took an active and constructive part. Later, at an executive meeting of the chapter officers, Les Hawes and Ben Hazewinkel sat in and also tendered pertinent suggestions. No fault to find with the chapter officers; they're loyal ASTEers but lack local support.

Got acquainted with Chairman Walter Brenneke, Secretary Bill Hibbs, Past Chairman Jerry Healy, Treasurer Jay Phelps, Lewis Ellingwood, Dan Melody, Bill Brennan, Mel Nielsen, Bill Brath and Lloyd Thomas, all of whom pledged themselves to active support of the ASTE. With that spirit, the chapter should forge ahead.

Among other places, paid a visit to Leupold & Stevens Instruments, Inc., where I was most cordially received and saw rifle scopes in process of manufacture. A nice plant set-up for manufacture of precision instruments. On successive days, lunch with Jerry Healy and Walter Brenneke. Both took me up to the "mountains" whence, beyond the panorama of city and broad rivers, majestic Mt. Hood graced the horizon, 45 miles away.

With Walter Brenneke, got in a "premiere" of a novel truck front axle, in which what may be termed the king-pin is in direct line with the center of the wheel. This obviates camber and toe-in and necessitates only nominal caster; consequently, steering is easy and trackage perfect. With the truck parked, one can turn the steering wheel as easily as one would turn the wheels of a standing passenger car. Potentials of a new and important industry for the West Coast.

From Portland to Seattle, there to attend the chapter meeting on January 22. A highly interesting and instructive talk on metal spinning by Ed Tollefsen of Boeing Airplane Co.

Seattle chapter impressed me with its *esprit de corps*. Good officers are encouraged by active membership support, everyone seeming willing to pitch in and do his share. Programs are set up far ahead, and a monthly news letter — Louis Butler, reporter — inspires enthusiasm. In talks with members during my tour, I gathered that the visit by Exec. Sec'y. Harry Conrad last fall, had been conducive to a lot of good among the West Coast chapters.

Through courtesy of Francis Coenen, Seattle chapter ch'man who made arrangements, and Harvey Buffum, supervisor of tool engineering at Boeing No. 2 Plant, I was privileged to see a revolutionary engine that has West Coast truckers gaping. The engine is yet to be tooled for mass production.

Expecting to see a huge power plant, I had figuratively to look twice before spotting it under the hood of a huge semi, where it replaced a conventional 200 hp diesel engine. For security reasons, and pending clearence, I can't go into detailed description here. I am, however, free to say that it is a gas turbine job, surprisingly small for its power and presently being tried out in land, air and water vehicles. Rotating at high speed and stepped down through a tiny planetary transmission, final drive is through a conventional transmission.

Throughout my itinerary — Golden Gate, Portland and Seattle chapters— I was extended the cordiality and good fellowship that prevails throughout the entire ASTE. North, East, West, South, we're just one body. What is needed on the Coast, however, and in Portland chapter especially, is the support of local industries which, in turn, have much to gain from the collective know-how of the entire ASTE membership. While many concerns give that support, without stint, there is nevertheless considerable educational work to be done with regard to impressing the value of tool engineering on the consciousness of West Coast industry. While primarily a function of the Coast and Mountain Area chapters, it is also a job for the entire ASTE. Let's all work toward that end.

News in Metalworking . . .

ENGINEERS TO MARK ONE-HUNDREDTH YEAR AT MILLION-DOLLAR CHICAGO CELEBRATION

Engineers this year are celebrating the centennial anniversary of the establishment of engineering as a recognized civilian profession in this country. Although some observances are being carried out all through the year, formal festivities on a national scale will begin early in July and last through a convocational program in September. The $1,000,000 Chicago affair will honor engineers in every branch of the profession, represented in 1852 only by civil engineering, which then comprised all activities outside the military field.

Leading figures in America's technical progress, such as Herbert Hoover, Charles F. Kettering, Karl Compton and other men of similar stature actively associated with the undertaking will be included among the 350,000 members of the 48 national and international engineering bodies which will participate.

Specific aims of the Centennial are to dramatize effectively for the public the principles which have produced the leading nation of the world and to point the way to further development; to acquaint the public with the part played in this development by the engineering profession and progressive management; and to attract qualified young men to study engineering to fill the future's great need for technically trained men in industry. Previously engineering convention programs usually have been rather strictly technical in character. However, this one will differ in that the aim is to present the story of engineering to the public in terms it can more easily understand and evaluate.

All forms of public media will be utilized to accomplish this, according to plans announced by Lenox R. Lohr, Centennial president. Primarily, a dynamic exhibit designed to impress on the public the importance of the basic principles behind development of our industries is scheduled for Chicago's Museum of Science and Industry. This factual display, which will be viewed, it is estimated, by more than 6,000,000 people during the five-year period it will remain there, will show not only technical advancement, but also the social consequences of such development. Dramatic stage production, radio and television programs, a motion picture for use throughout the country in schools, civic and professional societies, and publication of books and magazine articles for school children and laymen all will be aimed at public education concerning the engineer's role.

As the final highlight, a convocation, bringing together the world's outstanding engineers, will include in addition to specialized technical meetings, subjects of general interest presented in terms understandable to the layman and the non-specialist.

In short, the goal is summed up by Mr. Lohr in his remark, "In planning the Centennial, we hope to make it a means of awakening the public to all that engineering has meant, not only in industry, but in every other sphere of physical progress over the past century."

CUTTING TOOL GROUP AIDS SHELL MANUFACTURERS

A carbide cutting tool sub-committee of the Shell Committee of the American Ordnance Association now is in full operation. This committee, representing all manufacturers of tungsten carbide cutting tools, serves as advisors on carbide problems arising in shell manufacturing.

The group has assembled lists of all available technical data on application of carbides in shell manufacture which are ready for any shell producer. At the same time shell manufacturers are being advised of additional bulletins as rapidly as they are prepared by individual carbide producers.

In addition to these services, assistance is also being provided by the committee on the organizing of training programs relating to application of carbides in shell production.

J. S. Gillespie, Carboloy Department, General Electric Co., is chairman of the sub-committee. Membership includes P. E. Floyd, Allegheny Ludlum Steel Corp.; M. E. Backstrom, Firth Sterling Steel & Carbide Corp.; Bennett Burgoon, Kennametal, Inc.; R. T. Beeghly, Metal Carbides Corp.; H. W. Highriter, Vascoloy-Ramet Corp.; and W. N. Howley, chairman, AOA Shell Committee.

TEMPCO INSTALLATION

a

Largest knuckle-joint press ever built has a capacity of 4,000 tons. The giant, which stands 34 feet and weighs 305 tons, has a bed area of 60 x 70 in., and die space of 40 in. It is equipped with a six-station dial feed. The press, built recently by E. W. Bliss Co. for Regal Ware, Inc., will be used for coining and extruding operations on steel artillery cases. At the extreme left, Norman Steel, Bliss senior engineer who designed the press, watches it being run-in.

RYERSON OUTLINES PLAN FOR STAGNANT STEEL ROUNDUP

An active "sell it or scrap it" steel drive is under way by Joseph T. Ryerson & Son, Inc., in an effort to gather not only the production scrap, which is relatively easy, but to free idle steel and equipment and get it into use or back to the mills as scrap.

First step in the plan is to urge all steel users to make a thorough check of inventories of all steel that isn't being used or marked for use; idle and discarded metalworking machinery and allied equipment; and then decide if such items should be sold, kept or scrapped.

To help steel users dispose of items they are willing to sell, Ryerson has offered to publish, without charge, classified advertisements in its newspaper which is circulated nationally to approximately 100,000 firms in all lines of business. The plan, designed as an exchange between steel users, should make useable steel and equipment that might be lying dormant available to someone else who could use it. This has the added advantage of not only freeing idle steel and equipment, but of helping to relieve the pressure for new steel and aiding, as well, in maintaining a high rate of steel production.

TEMPCO INSTALLATION LEADS SOUTHWEST

Texas Engineering and Manufacturing Co., Inc., have recently placed in operation what is thought to be the largest anodizing, alodining and chromodizing installation in the Southwest area. It consists of six 5,500-gallon processing tanks, steam dryer, overhead bridge crane and a centralized control panel. One of the more unusual features of the Temco set-up is the single centralized control for all three processes—anodizing, alodining and chromodizing.

ROCKWELL ACQUIRES TWO FIRMS

Deluxe Saw & Tool Co. and the Karbide King Tool Corp. have been acquired by Rockwell Manufacturing Company according to a recent announcement by W. F. Rockwell, Jr., president of the firm. This brings the number of Rockwell subsidiaries and divisions to a total of 19.

Deluxe Saw & Tool Co. pioneered the manufacture of tungsten carbide tipped circular saws for industrial application. Beyond the new product functions of these plants, company spokesman said, they house extensive service facilities.

PENSALT CONSOLIDATES METAL CLEANING SPECIALTIES

The Pennsylvania Salt Manufacturing Co. has announced the consolidation of all its sales and service in chemical specialties for metal cleaning, fabricating and processing in one department which has been named the metal processing department. The department, headed by J. J. Duffy, Jr., sales manager, represents a merger of the industrial metal cleaners and the fos products departments.

PORTER-CABLE EMPLOYEES SPLIT PROFIT FUND

Porter-Cable Machine Company employees this year divided the largest profit-sharing fund in the seven-year history of the plan. According to the recent announcement, 452 eligible workers cut the $262,000 total to an average $679 share or 12.8 percent of each associate's annual wage.

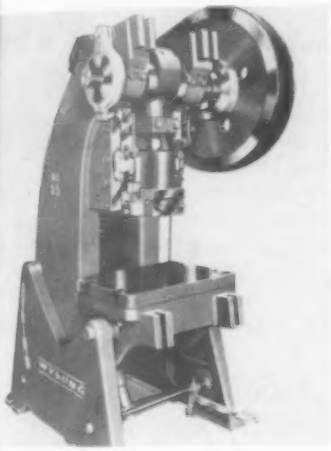
An additional $325,500 was allocated to several employee benefits including an employee pension trust, vacation and holiday pay, bonuses, life, unemployment and compensation insurance, social security and employee activities.

The increased profit over previous years was attributed to the highest sales volume yet attained in the firm's history, due, among other things, to increased demand for defense production, officials of the company said.

Tools of Today . . . .

Punch Press

A 55-ton, open-back, inclinable punch ss has been placed on the market by ysong and Miles Co., Greensboro, C. New features are claimed for press. The square pin type clutch h three points of engagement and lt-in non-repeat unit is used. The rdened tool steel wear plates for the tch pin are replaceable without re-ving the fly wheel. The cam oper-on and spring loading of the clutch ger assures complete disengagement the clutch, providing exceptional ety for the operator. It also prevents cking and unnecessary wear on tch parts. Patent has been applied on these features.



Another feature of the press is the 2-in. die space. This measurement from bed to slide is taken with stroke down and adjustment up.

Construction is from hi-tensile cast-ngs. Steel content of casting is labor-tory-controlled to insure maximum trength and rigidity. All parts are ccurately machined and fitted with jigs nd fixtures.

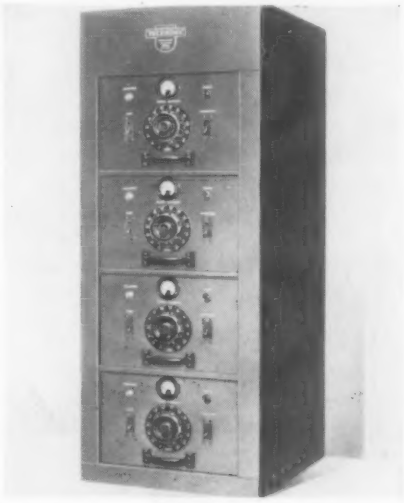
The crankshaft is an alloy steel forg-ng, mounted in bronze-lined bearings. Standard brake is split type with spring ensioner. Intermittent brake can be urnished. Slide is hand scraped to nsure accurate bearing and is adjust-ble with ball and socket screw. Knock-out bars are furnished for the slide.

T-4-991

Induction Heaters

Multiple 2½ kw induction heating units, combined in a single cabinet, are now available for general purpose applications.

This induction heating equipment fills the need especially for high production industries. Individual units can be removed and replaced, similar to a drawer of a filing cabinet. The heating stations can be located at any place



in the production line. It also fills the need between the existing low-power and medium high-power machines.

The 2½ kw machine, Model 100S, is available from its manufacturer, the Induction Heating Corp. 118 Wythe Ave., Brooklyn 11, N. Y., in a number of rugged heavy gauge steel cabinets, in any combination, designed to meet the user's particular requirements. They may be in the form of heating sections and power supply in one cabinet, or the heating section may be remotely located from the power section.

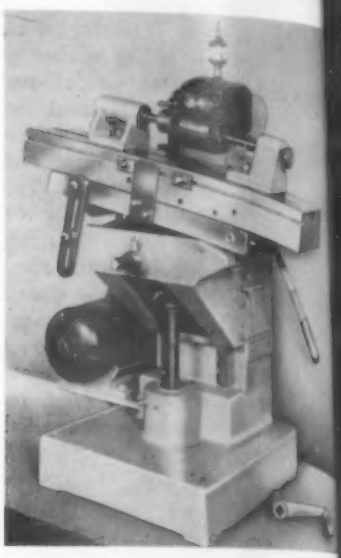
Equipment includes circuit breaker type switches for primary and heat-on circuits, load indicating ammeter, optional, continuously variable output control for zero to full power application, automatic heat-on timer, filament and heat-on indicators, quick disconnect plugs, and receptacles for connecting power section to heating section.

Input requirements per section are 4 kva at 220 volts, 60 cycles, single-phase, and built to conform to Federal Communications Commission regulations covering industrial high frequency equipment.

T-4-992

Milling Machine

The compact Gay-Lee commut... under-cutting milling machine is ... gedly engineered for use with carb... tools. It is particularly designed ... high-speed production applicatio...



Important physical features are hig... speed spindle, heavy rugged cast-ir... frame, pre-loaded ball bearing tab... with tilt provisions for better visibili... hardened and ground elevating screw... ½ hp motor with V drive, and lub... fittings throughout.

Complete details on the new mill ca... be obtained from Gay-Lee Co., Clay... son, Mich. T-4-100...

Titanium Brazing Flux

Handy & Harman announces the de... velopment of a special brazing flux fo... use in the joining of titanium an... zirconium, and their alloys. Silve... brazing alloys readily wet the titaniu... which is protected by the flux.

Although titanium and zirconiu... form brittle compounds with mos... metals and alloys that may be used fo... brazing, the embrittlement may be... minimized by rapid heating and limit... ing the time at brazing temperature... For this reason, low temperature braz... ing alloys such as Easy-Flo are pre... ferred. The lower temperature also... minimizes oxygen and nitrogen con... tamination of the titanium. Tensile... strengths of 45,000 to 50,000 psi are... obtained with butt joints in commer... cially pure titanium. Lap joint test... specimens may break outside the joint... if the lap is more than three times the... thickness. Heating may be done with... either oxyacetylene torch or furnace;... ordinary brazing technique is used.

T-4-1002

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THE TOOL ENGINEER'S *Service Bureau*

DE LITERATURE CURRENTLY OFFERED BY THE TOOL ENGINEER ADVERTISERS

ERATURE NUMBER	COMPANY	BULLETIN	DESCRIPTION
-3	Ace Drill Bushing Co., Inc.	1101-2	Catalog describes the accuracy and exactitude of Ace Drill Bushings.
	American Broach & Machine Co.	300	Deals with automatic clamping, production and broaching problems.
	American Wheelabrator & Equipment Corp.	23	Describes the simplification of wet blasting by new "Liquamatic."
	F. E. Anderson Oil Co.	213D	Concerns Stamping with Lusol; information on machine cleaning, elimination of smoking and objectionable odors.
	Armstrong Bros. Tool Co.	S-48	Tool holders for every operaton on lathes, planers, slotters and shapers.
	Behr-Manning Corp.		Information on coated abrasive grinding and polishing tool methods.
	The Bellows Co.		"Foto Facts File" deals with air-powered feeding by Bellows "Controlled Air Power" basic devices.
	Besly-Welles Corp.		Cutting tool manuals giving information on Besly drills and reamers.
	The Cincinnati Shaper Co.	B-3	Discusses the versatility of the economical Cincinnati Press Brake.
0-1	Columbia Enterprises		4-page illustrated catalog introduces new Columbia No. 2 vertical milling machine. Stresses efficiency and economy.
	Cone Automatic Machine Co.		Discusses dependability and money-saving operation of "Conomatic."
3	Crucible Steel Co. of America		Tool steel selecter helps to make proper selection of steel for various uses.
7	Ettco Tool Co., Inc.	7	Complete line of tapping attachments covered in bulletin.
9	A. B. Farquhar Co.		Catalog shows various sizes and capacities of Farquhar hydraulic presses.
	Federal Products Corp.		Folder points out the accuracy and light weight of snap gages.
7	Firth Sterling Steel & Carbide Corp.		New Firthite handbook gives information on increased production and reduced operating costs with Firth Sterling standards.
6-1	Galland Henning Mfg. Co.	SW-1	Nopak cylinders recommended for mechanically or manually-operated presses; time-saving, speedy production.
6-1	The J. C. Glenner Co.		"Circular Index A" points out the advantages of using removable taper shanks for small tools.
3-1	Graysmills Corp.		New catalog shows selection chart giving the right pump or coolant system for the job.
4	Grinding Wheel Institute		Bulletin "Standard Shapes and Sizes of Grinding Wheels" discusses safe rules and specifications in the use of grinding wheels.
0	Hammond Machinery Builders		Catalog discusses economy and speed in the use of carbide tool grinders.
4	Hanna Engineering Works	233A, 236, 254	Catalogs deal with low pressure cylinders, hydraulic cylinders and Hanna valves.
0	Hannifin Corp.	150	Bulletin presents complete story of Hannifin "Hy-Power" hydraulics in plant operations.
3	Hardinge Brothers, Inc.	8	Accuracy, durability and economy are stressed in bulletin, using company's chucks and collets.
0	The Hartford Special Machinery Co.		Super-Spacers, automatic thread rollers and die polishers discussed in bulletin for use on automatic drilling and tapping machines.
5	Haynes Stellite Co.		"Haynes Stellite Metal-Cutting Tools" gives information on chip formation, tool design and machinability of metals.
6-1	Henan-Crane Corp.		Bulletin offers information, specifications, etc. on automatic self-cleaning coolant filter.
5	Illinois Tool Works		Booklet describes procedures on quick correction of gear errors.

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A-4-116	The Charles L. Jarvis Co.		Catalog suggests methods of economy and speed in grinding, cutting, buffing, etc.
A-4-157	Jones & Lamson Machine Co.		Tangent and Radial Die Catalogs offer information on company's products.
A-4-14	Lapointe Machine Tool Co.	VPU-5	Specifications presented on all Lapointe vertical pull broaching machines.
A-4-123-1	Marac Machinery Corp.	7	Brochure explains and illustrates features of economy perfection in milling machines.
A-4-193-1	Metal Carbides Corp.	50-C	Catalog reveals advantages of Talide tools, dies, blades other tungsten carbide products.
A-4-98-1	W. F. Meyers Co., Inc.	13	Offers information on solving tough production problems; bushings made to ASA standards.
A-4-187	Morton Machine Works		Illustrated catalog shows complete line; includes templates for tracing purposes.
A-4-161	National Broach & Machine Co.	549-5	Bulletin gives a detailed discussion of gear tooth end-bearing, etc.
A-4-176-1	Oakite Products, Inc.		"How to Strip Paint" with Oakite materials revealed in free booklet.
A-4-177	The Oilgear Co.	44200	Bulletin shows easy-to-install Oilgear "JK" livery Feed Pump System."
A-4-66	O'Neil-Irwin Mfg. Co.		"Die-less Duplicating" catalog gives full information all Di-acro benders, brakes, shears, punches, etc.
A-4-112-1	Ortman-Miller Machine Co.	28	Catalog shows "More power in less space;" diagrams pages of specifications, parts listing and other information.
A-4-21	Pope Machinery Corp.	82	Information offered on new super precision 1-hp, rpm motorized tool and cutter grinder head.
A-4-26	R and L Tools		28-page catalog describes company's line completely.
A-4-185	Scully-Jones & Co.	17-50	Bulletin gives detailed description and technical data "Roll-lock" chucking tools.
A-4-204	The Sheffield Corp.	CTP-491	Complete specifications offered on Sheffield Precision all-around gage.
A-4-5	Standard Gage Co.	B	"For doing the job better-easier" catalog gives complete details on use of gages, dial indicators, comparators, etc.
A-4-112-2	D. A. Stuart Oil Co.		New booklet, "More than a Coolant is Needed" discusses planned application of Stuart cutting fluids.
A-4-15	Sun Oil Co.	TE 4	Booklet reveals facts on economy and accuracy in the use of company's cutting oils.
A-4-113	Super Tool Co.	50	Hints for machining aluminum, cast iron, steel etc.
A-4-163-3	Surface Checking Gage Co.	A	Folder gives information on control of surface quality through adoption of Surf-Chek method.
A-4-140	Taft-Peirce Mfg. Co.		Taft-Peirce CompAIRator air gage described in bulletin; speed, accuracy, economy stressed.
A-4-197	Valley Machinery & Supply Co.		Free catalog offers information on brazing carbide tool tips on tool shanks.
A-4-126-2	Valvair Corp.	T-4	Information on the new Valvair solenoid pilot valve given in new bulletin.
A-4-115	Vlier Mfg. Co.	53	Time-saving features and accuracy in dimensions are stressed in catalog offered.
A-4-156-2	V & O Press Co.		Descriptive catalogs contain complete specifications and operating details on V & O precision power presses and feeds.
A-4-193	Waukesha Tool Co.		"In Reamer Work of Every Kind Means More Holes Per Grind" described in new catalog.
A-4-122	Wendt-Sonis Co.	52	Catalog gives illustrations and specifications on complete line of carbide cutting tools.

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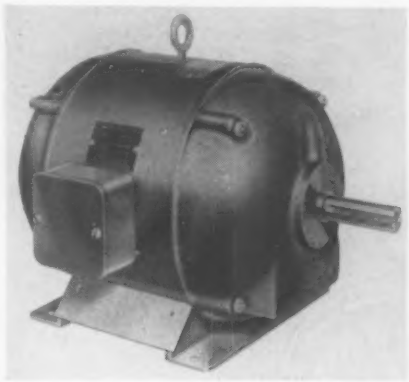
125 HP Motors

The Industrial Motor Div. of Robbins & Myers, Inc., Springfield 99, Ohio, announces the addition of four frame sizes, expanding its line of standard motors to include 125 hp ratings.



The four new sizes supplementing the regular lines are designed for all-weather operation, with special treatment to resist moisture and corrosion. All steel parts have a baked-on, rust-resisting undercoating. The rotor assembly is treated with a special rust-inhibitor and the cast-iron end-heads and terminal box are cleaned and given an anti-corrosion treatment of zinc chromate. Power lead-ins are sealed at the motor shell with a non-hardening compound.

Extra-wide, pre-lubricated ball bearings containing special laboratory-tested greases resist the adverse conditions of dust, temperature, humidity, and speed. Under normal operating conditions, these bearings will not require lubrication for at least five years.

The four new ratings will be made in NEMA frames 444, 445, 504, and 505. **T-4-1031**

Dust Collector

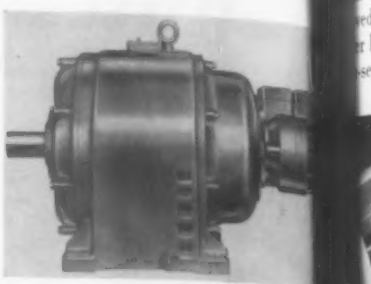
Pangborn Corp., Hagerstown, Md., offers a cloth-bag collector for dusts such as carbon black, cork, fine wood, graphite, pigments, lime, lamp black, soap, fine tobacco, metal oxides and other dusts with similar characteristics.

The cloth-bag dust collectors range from 5 to 40 feet long, contain 1,360 to 10,880 square feet of filter cloth, employ from one to six hoppers, and are supplied with the appropriate structural supports to furnish the type of disposal desired, wheel-barrow, car, truck,

When the equipment is in operation, dust-laden air piped from the plant enters the collector at a point just under the grid floor. The air loses velocity and the heavier particles fall immediately into hoppers. The air then rises through the grid into filter bags sealed over each grid opening. All air passes through the bags on its way to the air outlet at the top of the collector. **T-4-1032**

Speed Reducer

A fluid-powered speed reducer, veloped by the Rucker Co., 4226 H St., Oakland 8, Calif., makes avail to users all the gear ratios of con tional speed reducers with com control of motor speed from 0 to rpm, at constant torque and with reversibility; also extreme torque d to 1 rpm, according to the maker.



In this speed reducer, a speci designed hydraulic motor replaces conventional electric motor as a po source. The maker says this fl powered unit can be trusted to skilled labor, because there are rheostats, belts or gears to shift; po transmission is shockless. The fl motor is explosion proof.

It is made in sizes up to 100 hp put, with larger sizes custom-built meet specific conditions. T-4-10

Hose Coupling Machine

A hydraulic hose coupling machi for making permanent hydraulic h assemblies is announced by Pyles I dustries, Inc., Detroit, subsidiary of T Aro Equipment Corp., Bryan, Ohio.

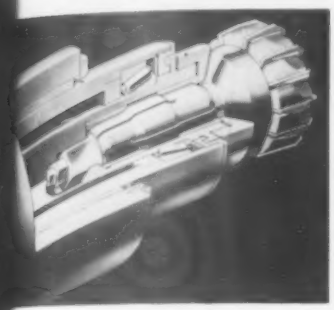
Introduction of the machine shou enable users of hydraulic hose, incl ing manufacturing plants and industri jobbers, to save time, avoid delays a reduce costs by making their own h assemblies.

The desk-size machine, floor spa 67 x 29 in., is easy to operate, and d a complete assembly and swaging j Ample drawer space is provided f needed accessory attachments and p ductive material. An operator usi this machine can produce a finish hose, coupled at both ends, in fo minutes. The two-piece steel coupli used in the process takes greater pr sure, prevents breathing and resi corrosion.

The machine has a cutting wheel cut hose to length. For the next step wire wheel attachment is used to ski each end of hose. Then the operat manually assembles sleeve on hose e inserts coupling with power spinn and places coupling in the press, wh swages it permanently with only o pass through the dies. T-4-10

Cutter Driving Device

cutter driving device which for the time makes possible the pre-setting many types of tools has been anced by The Cross Co., Detroit 7, h. Known as the Cross-drive, the arrangement features quick changpre-set cutters, and a spindle drive ch holds the cutter rigidly and prely. Cutters can be changed in less a minute. The worn cutter is reed by sliding it out of the spindle loosening a large lock nut. A new set cutter is then inserted.



Lost time is eliminated with pre-set ters, because adjustments are made ile the machine is running. There o need for trial cuts in the machine ce the cutter length is pre-set to a l indicator reading within 0.0005. A ster length gage is supplied with the ure to establish limits on the indior.

A true-running tool is assured beuse the long, straight shank of the ossdrive is gripped securely by a r-point collet. A large square at the d of the shank makes the drive posie. An adjusting screw takes the rust solidly against the bottom of the e in the spindle. The Cross-drive is aptable to a variety of cutters. Shank es have been standardized in diaeters of 1½, 2 and 2½ in. **T-4-1051**

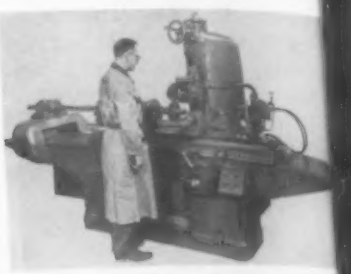
Shakeproof Screw

Shakeproof Inc., division of Illinois ol Works, Chicago, has announced e development of a thread-cutting rew for driving in holes that have come clogged with porcelain enamel a result of finishing operations. The rew is suited for final assembly opations in the manufacture of stoves, frigerators, washers and other units here hard enamel finishes are applied. Principal feature of the screw, in adtion to its basic thread-cutting action, a four-sided reaming point. As the rew is turned into an enamel clogged le, the sharp edges on the pinched amer point scrape the hole clean and low normal thread-cutting action to llow. Without this cleaning action, e screw would not enter the hole and separate reaming operation would be quired. **T-4-1052**

Helical Gear Grinder

The Red Ring helical gear grin model SGP, while designed prima for the high precision form grinding helical gears, may also be used spur gears and splines.

This helical grinder is based on lead bar principle with certain re ments. Essentially this consists of



accurately ground master lead bar, erating through a pressure lubrica self-tightening antibacklash saddle n with the work drive headstock coupl through the index plate to one end the bar. As the lead bar is reciprocate the work rotates with it. Thus, the le of the work being ground is accura and identical with that of the dir coupled master lead bar.

The split saddle nut through whi the lead bar reciprocates is rigid supported by a bridge housing bolte to the machine base. National Broac and Machine Co., 5600 St. Jean, D troit 13. T-4-10

Aluminum Paint

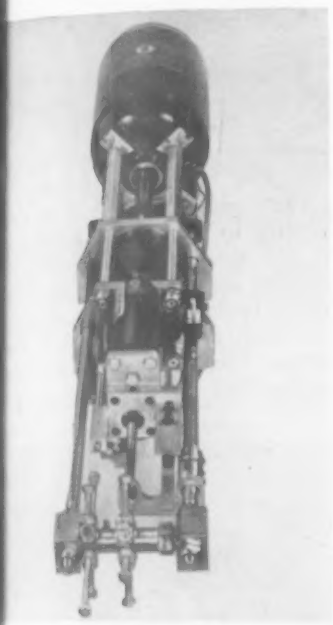
Produced by Tropical Paint and O Co., Cleveland 2, the new paint, calle Thermalite, was developed to surv in the 200-1000 deg heat range. Si cones are part of its film-forming solid aiding the metallic portion to adhere metal and preventing blistering, bur ing, flaking or discoloration usually e perienced under extreme heat. It pro vides a silver-bright finish with hig resistance to rust, heat, chemical fume and weather.

Thermalite requires a temperature 200 deg for an hour or more to fuse set on the metal. It is used to preve deterioration and provide good appea ance on airplane and Diesel exhau stacks, as well as on mufflers, manifold and engine blocks, especially where constantly exposed to the weather. In dustrial applications include boile fronts, melting pots and ladles, steam lines, hot exhaust tunnels and stacks o all types, the insides of vulcanizers and baking ovens and similar problem sur faces. T-4-10

USE READER SERVICE CARD ON PAGE 101 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Drilling Unit

Black Drill Co., Inc., 1400 East 22nd Cleveland, announces the develop- nt of a drilling unit suited to a much er than ordinary range of work. ombines all the well-known features the standard traversing motor shaft e drilling unit with a four-inch rking travel and a skip stroke at- hment, making it suitable for deep illing in hard-to-get-at locations, and urate drilling in materials requir- frequent chip clearing.



This unit is designed to operate in y position. Air feed provides rapid ockless advance to the work. Hy- raulic control provides uniform drill ed even when breaking through. icrometer stop insures depth accuracy 0.001 in. Calibrated stop control akes adjustment easy. From one to x easily adjusted skip stroke stops are ovided. Interlocking and auxiliary ntrols are easily installed. **T-4-1071**

Packaging Machines

Two packaging machines, designed r automatic volume bundling and re- forcing with tape, were announced the Guide Co., Canfield, Ohio.

Both machines, the model G.W. and e model C.G., were developed for ster and more economical heavy-duty ackaging jobs, according to the pro- ucer.

The model G.W. is able to apply one two complete wraps of pressure- nsitive filament tape around cartons, ndles of cartons, and other similar ems at the rate of five bundles or rtons per minute. It does the job by tomatically starting the tape on the rton, wrapping it as desired, and cutting it at completion of the wrap. A single operator controls the machine.

Weighing approximately 1,500 pounds and requiring an operating area 4 ft wide by 7 ft long by 9 ft high, the model G.W. is able to handle bundles within limits of 4 to 20 in. in both height and width, and a minimum length of 6 in.

The model C.G. is for mass production bundling jobs, automatically loading, applying tape, and unloading a bundle as often as every 20 seconds. It is particularly suited for bundling metal stock, pipe, conduit, tubing, lumber, and other elongated materials.

Also manned by a single operator, the model C.G. features a center section which receives, nests and clamps the items to be bundled, plus two adjustable tape-applying heads (at either end of the center section) which wrap the bundle with tape. The machine also severs the tape and lifts the bundle onto a skid for shipment.

Designed for use with wide conveyor tracks or inclined tables, the model C.G. weighs about 6,500 pounds, and occupies an area 17 ft wide by 5 ft long by 4 ft high. **T-4-1072**

Machine Pin

Spirol pins are machine pins which have been engineered to overcome the inherent shortcomings of fastening pins. They are formed by rolling strip steel spirally. The spiral cross-section makes the pin unique, and provides the pin with its many desirable features. The pin is a coiled spring whose physical properties can be changed by varying the thickness of the strip, the tightness of the coils and the number of coils in the spiral.

An infinite number of pins with different physical properties can be made, ranging from a strong and rigid pin to a weak and flexible pin. The force required to insert the pin can be varied so that one pin will require heavy pounding while another can be inserted merely by pressure of the thumb.

The pins will stay in the hole and not creep out, because the resistance of the coils of the spiral to displacement causes the pin to assume the shape of the hole throughout its length, and securely locks the pin in position with a uniform distribution of stresses.

They can be easily removed and reassembled because they expand to their normal size upon removal, and do not damage the hole upon insertion or removal.

Spirol pins are used in holes drilled with standard drills with no reaming. While standard pins are made from strip steel and are heat treated, they can be made from other materials such as stainless steel, brass, aluminum, and other flexible materials.

The pins are available in three standards: heavy duty, medium duty and light duty. Made by the C.E.M. Co., 24 School St., Danielson, Conn.

T-4-1081

T-Lathes

By using standardized lathe units now being imported by Kurt Orban Co., Inc., 21 West St., New York 6, it is possible to assemble complete machines for a wide variety of requirements.

These sectionalized T-lathes, manufactured by Heyligenstaedt & Co., one of Germany's largest machine tool builders, are equally adaptable to turning or facing jobs, and to production line work or the machining of single pieces. They are specifically designed for handling large pieces.

A unique feature is the synchronous motor feed. A pilot motor on the headstock is electrically connected to a servo motor on the saddle. This method of feed eliminates the need for mechanical feed transmissions which limit effective turning length. It also permits adjusting the cross bed and rear toolpost pedestal to any desired position on the baseplate; for example, in a transverse position for facing cuts, or in a longitudinal position with a secondary bed with saddle and toolpost arranged for end turning.

Sectionalized lathe units are made in four models, with height of centers ranging from 37 to 47 in. and with a maximum work diameter of 235 in. The two smaller models have infinitely variable spindle speeds; eighteen speeds are provided in the two larger models.

Sectionalized T-lathes are available for prompt delivery. Complete stocks of replacement parts are available at the company's service center, 4220 Prospect Ave., Cleveland 3. **T-4-1082**

Coolant Filter

This web type filter features a self-aning, continuously rotating filter h. Use of the complete filter bed ables this filter to handle a large ume of coolant. An endless web-e belt utilizes the same filtering dium over and over and lasts for g periods of operation.

Designed to serve individual machine ols or small central coolant systems, e web type filter is suited for all pes of grinders, broaches, drilling, pping, milling machines, etc., where-er a mineral or soluble oil coolant is ed. The unit occupies a minimum of or space. Overall size of the 50 gpm odel is only 47 x 42 x 30 in.

In operation, contaminated coolant m machine tools flows by gravity or stem pressure over the surface of the tating filter belt. The liquid passes rough the web, into a clean-coolant nk, leaving chips, abrasives and other lid particles to be carried off by the oving web and deposited into a chip an or hopper underneath the filter it. Filtered coolant is then pumped ck to machine sumps.

For information, write the Honan-rane Corp., 767 Wabash Ave., Leban-n, Ind. **T-4-1091**

Pump Motor

A 2000 psi vane-type oil hydraulic mp that can also be used as a fluid otor has just been announced by the enison Engineering Co., Columbus, hio.

This pump/motor is of single stage sign and reported to incorporate a w principle of radial balance and nstruction. No alterations of any kind e necessary, within the unit itself, to ilize its two-way performance. Used terchangeably, it reduces inventory quired where both types of units are gularly used.

In addition to these dual-purpose alities, the unit permits either clock-ise or counter-clockwise rotation, for oth pump and motor operation. Di-ection of rotation, in any type of appli-ation, can be reversed by means of a mple change in position of the pump-ng cartridge. The three major parts f these pumps are easily disassembled removal of a few cap screws.

T-4-1092

Cam Valve

A small companion model to its [illegible] of cam-operated valves has been [illegible] nounced by Ross Operating Valve [illegible] 120 East Golden Gate, Detroit 3.

Excluding the cam roller, the [illegible] unit is less than 4 in. high and has [illegible] 3 x 3½ base. It is a ¼-in. four-[illegible] valve with a long lever. The lever tra[illegible] is less than 1 in.

Known as Ross valve number [illegible] this model is a small, rugged versi[illegible] of the Ross cam-operated valve. It [illegible] especially suitable for low volume a[illegible] plications requiring a mechanically [illegible] erated valve. T-4-11[illegible]

Precision Lathes

British Industries Corp., 164 Dun[illegible] St., New York 13, N. Y., is the exclu[illegible] sive representative in the U. S. fo[illegible] Smart & Brown Machine Tools Ltd[illegible] London, England and is now offerin[illegible] for early delivery three styles of Sma[illegible] & Brown precision lathes.

The model L 8-in. swing is suitabl[illegible] for both toolroom and production pur[illegible] poses. It can be had with a wide rang[illegible] of attachments and is ideal when use[illegible] as a small high-speed extremely pre[illegible] cise turret lathe.

The model M 8-in. swing shown here[illegible] is a precise toolroom lathe, with spin[illegible] dle speeds of 99 through 1950 rpm.

The model A 9-in. swing is a precis[illegible] toolroom lathe, with spindle speeds o[illegible] 39 to 1430 rpm.

All spindles are on taper roller bear[illegible] ings. Machines take American collets, [illegible] are calibrated in inches and are wired [illegible] and motorized to American NEMA [illegible] standards. T-4-11[illegible]

Belt Grinder

A belt grinder which is adaptable to wide range of grinding operations has been placed on the market by the Peter-Cable Machine Co. of Syracuse 1, N. Y. Equipped with a standard 1-in. belt which runs over a 12½-in. platen, the grinder is an economical unit for medium work. It handles jobs which previously had been run on larger and more expensive belts in production lines, job shops, toolrooms and maintenance and repair departments.

The grinder, designated model 506, is used primarily for free-hand applications on work which requires flat surfaces, deburring, squaring, chamfering, rounding, and polishing. It is suitable for metal, wood, glass and plastics applications.

The grinder is equipped with two-speed pulleys for 3300 and 4000 sfpm. The drive unit for the machine is 1 hp, 220/440 volts, 60-cycle, 3-phase, 1750 rpm. It is totally enclosed.

T-4-1111

Indicator Holder

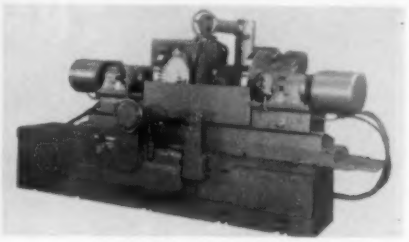
The Cullen Mfg. Co. of Racine, Wis. is introducing model 200 magnetic dial indicator holder with a precision adjusting device controlling the positioning of the dial holding rod. This eliminates any possibility of the spring tension in the rod lifting the indicator off the work after the rod and indicator are placed by hand.

With the model 200, the machinist swings the holding rod and indicator to within ½ in. or so of the work. Then, by turning the thumb screw on the holder's magnetic base, the machinist can make the most minute adjustment of the indicator either against or away from the work without touching the rod or indicator.

The model 200 indicator holder has a 45-50 lb pull magnetic base, and will adhere positively to any metal that will hold a magnet. Magnets are guaranteed lifetime Alnico. The holder rod is 6½ in. long non-magnetic, ¼ in. stainless steel. It is set in a ball socket permitting universal settings and immediate readings, impossible with other type bases. Adaptor bushings are available for use with indicators having ⅝ in. or ⅜ in. openings. **T-4-1112**

Cylindrical Grinder

A high production plain cylindrical grinder for grinding blade tips of jet engine rotors has been developed by the Landis Tool Company, Waynesboro, Pa. This machine is identified as a 30 x 48-in. type CHW plain grinder with special work heads. Each headstock drive is an a-c motor and power is transmitted to the spindle by means of multiple vee belts.



The unique feature of this precision grinder is the twin headstocks with hydraulic chucking. With this arrangement, a complete jet rotor may be put in grinding position on one headstock, while the other rotor with blades is being ground. This operation finish grinds the tips of the blades to an exact dimension.

When one grinding cycle is complete, the carriage traverses so that the second head will be in grinding position. This permits the operator to unload the finished piece and put another rotor on the spindle.

All controls are located so that each head may be individually operated. The work carriage moves by hydraulic power. Extra-wide carriage ways are provided for maximum stability of the large diameter workpieces. **T-4-1121**

Laminating Resin

Development of a new polyester laminating resin which will withstand temperatures as high as 500 deg, was announced by Naugatuck Chemical Div., United States Rubber Co.

The new resin is expected to find its most significant use as a structural material in the manufacture of high-speed aircraft and guided missiles. It has physical and handling properties comparable to other types of polyesters now available with the added benefit of high strength at high temperatures.

Laminates made with the resin and glass fabric retain good flexural strength (40,000-47,000 psi) when exposed for as long as 200 hours at a temperature of 300 deg F. Good flexural strength (over 30,000 psi) is also obtained when exposed for as long as 24 hours at 500 deg F. The heat resisting properties of the resin are made possible by the use of a new chemical, triallyl cyanurate. **T-4-1122**

Gear Roller

The Cima gear hobbing machine for ...r, spiral and worm gears, recently ...roduced to the American market, is ...igned for climb-cutting.

It is of the universal type, for spur ...ears, and comes equipped with a dif...erential mechanism for the simplifi...ation of cutting spiral gears. The ...utter head is arranged for tangential ...eeding for the purpose of generating ...ultiple start worm gears with greater ...ccuracy and full contact without ...idges on the tooth flanks. Worm gears ...ay be generated by means of fly ...utters, which feature is indispensable ...or repair work, permitting the ac...urate production of a worm gear for ...hich a hob is not available. Due to ...he tangential feed head, single or mul...iple thread worms can also be pro...uced on a production basis. For this ...urpose, the worm blank is placed on ...he hob arbor and a gear generator ...utter on the work arbor; in other ...ords, reversing the usual method by ...having the cutter on the work arbor ...and the worm blank on the hob arbor. ...George Scherr Co., Inc., 200 Lafayette ...St., New York 12. **T-4-1131**

Conveyor

Rapid-Wheel gravity conveyor with ...special wheel arrangements and spac...ings to handle many different types of ...merchandise is now being manufac...tured by the Rapids-Standard Co., Inc. ...of Grand Rapids, Mich. Included are ...models designed to handle small tote ...boxes, cylindrical products, and small ...parts.

The tote box conveyor was developed ...for handling small wire or metal tote ...boxes with stacking chimes. It is avail...able with steel, aluminum or rubber ...wheels mounted on 4-in. high side ...frames which serve as guard rails. Wheel spacing is on any multiple of 2¼ or 3 in., with conveyor width determined by size of tote box.

The trough conveyor is used for conveying cylindrical products through receiving, production, inspection, or shipping operations. It can be had with steel, aluminum, rubber, or Neoprene wheels spaced as desired. The width of the conveyor is optional, depending on diameter of cylinder conveyed.

The fence conveyor is designed for handling small parts through operations where fences are needed to divide the width of the conveyor into two or more lanes. Wheels are placed on any multiple of 1½-in. axle spacing and in any desired pattern. Height of side members and divider fences are made to order.

The laned conveyor has the two center rows of wheels arranged to form an open channel for handling rolls of paper, mortar shells, and similar cylindrical products. This spacing does not interfere with handling wide sheets, cartons, and other materials on the same conveyor. Wheel arrangements to form several separate lanes may also be had if desired. **T-4-1132**

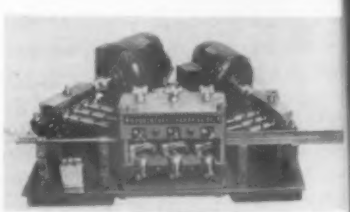
Thread Roller

Hartford Special Machinery C... Hartford, Conn., announces a ... larger capacity automatic thread rol... model A-312-H, which will roll mach... screws from size six to 5/16 in. ... diameter and thread lengths up to ... in. Production rates are 80, 100, ... and 140 pieces per minute, depende... upon size of screw to be rolled. T... machine requires a floor space 4 x 6 ... It is 62 in. in length by 39½ in. ... height with an over-all height of 63 ... in. The height from floor to hopper ... 53 in.

Standard die dimensions are 15/16 ... thick by 5 in. long for the moving d... and 15/16 x 4¼ in. for the fixed d... Standard die depths are 1, 1½ a... 2⅛ in. with a special depth of 2⅝ ... available. After rolling, screws are a... tomatically ejected into a funnel whic... leads to a tote box in the rear of th... machine, where it is unloaded by th... operator. The thread roller is equippe... with a 5 hp motor with a startin... switch and automatic cut-out for ove... load safely. T-4-11...

Rod Straightener

Model AYZ rotary straightener i... now being manufactured by Macki... tosh-Hemphill Co., 901 Bingham S... Pittsburgh 3, for the metalworkin... electronic, jewelry, instrument and re... lated industries who need to remov... waves, bends and kinks from cu... lengths of 1/16-in. rod or tube of up to ... ¼ in. OD thin wall tubing.



The basic feature of the model, which ... is the smallest size in a line of 12 ma... chines, is its roll arrangement. It has ... three sets of identically contoured twin ... cross rolls, all power driven. In prac... tice, the middle pair of rolls is adjusted ... up or down so that the correct amount ... of offset for good straightening effect ... is maintained between the horizontal ... middle roll pass and the horizontal ... entry and delivery roll passes.

Rod or tube is straightened by re... volving cut lengths of stock spirally ... through the three sets of cross rolls. ... According to the manufacturer, all six ... ¾-in. diameter rolls are angularly ad... justable so that each roll bears along ... its whole face on the rod or tube to ... be straightened. T-4-11...

Hydraulic Line Unit

A standard filling-bleeding tank for use in servicing hydraulic lines is announced by Superdraulic Corp., 14256 Wyoming Ave., Detroit 4.

This unit holds 2½ gallons of oil and meets military specification MIL-T-5522. It is also readily adaptable to use with all types of hydraulic systems in automobile, aircraft and other equipment. It is equipped with filler cap, air inlet valve, pressure gage, relief valve, automatic shut-off valve within the tank, dispensing hose and control valve.

The feeder-bleeder unit is capable of operating efficiently at a temperature range of from minus 65 deg to plus 130 deg and is proof-pressure tested at 300 psi.

T-4-1151

Comparator

Pratt & Whitney, Div. Niles-Bement-Pond Co., has developed a special electro-limit radial internal clearance comparator that gives fast, accurate measurements of the radial internal clearance in ball bearings.

In operation, the comparator works like this: A bearing is placed over a mounting spindle of a size corresponding to the ID of the inner ring. The ring is located axially by a backstop on the spindle. The outer ring is free to float both axially and radially. The floating electrolimit head assembly calipers the thickness of the bearing from the ID of the inner ring to the OD of the outer ring. By means of a cycling timer, the pressure cylinders are operated automatically and the measuring load is applied upward and downward in successive operations. When the pressure is applied upward to the bottom of the bearing, the assembly is opened at the top for maximum radial play indication. When the pressure is applied downward to the top of the bearing the assembly is closed at the top for minimum radial play indication. The successive movements of the outer ring are registered on a precision indicating meter and the difference between the two readings is the existing radial internal clearance in the bearing.

T-4-1152

Titanium Carbide Gage

The Pipe Machinery Co., 909 E. 7... St., Cleveland, has perfected and p... duced thread ring gages made w... titanium. The new material combi... tion of titanium and carbide is kn... as Demark.

These thread ring gages are light ... weight and show long wear life, tes... for four years in actual production ... on assembly lines. A recent call h... of gages on test has shown a state ... no measurable wear.

Eliminated is the need for buildi... wear allowance into the gage. Ma... factured to such a degree of accura... a special wear check plug is provid... with each ring. This special plug is ... double-end type with one end slight... larger to detect any possible wear.

Every gage produced is a register... gage with serial number engraved o... the metal. Its lead, angle, diamet... and hardness are recorded and file... under that number. In this manner, ... complete life history of each gage an... its check plug is kept on record.

T-4-1161

Drafting Scales

Universal Drafting Machine Corp... 7960 Lorain Ave., Cleveland, is intro... ducing a line of standard improve... metal drafting machine scales market... under the trade name Duraline. Th... line consists of twelve standard type... of graduations most used by civil, me... chanical and electrical engineers, draft... men and architects. Each style is avail... able in 6, 12, 18 and 24-inch lengths.

Duraline scales are made of an al... minum alloy, one of the most stabl... materials and one that possesses all th... advantages of boxwood but that ha... none of the disadvantages. It will main... tain its engine-divided accuracy an... hold a true smooth ruling edge. Uni... formity of line length and depth of th... large, easily read numerals are imme... diately apparent. The graduations do... not extend to the drawing edge—conse... quently with no "file teeth" to act on... the pencil point, graphite smears are... eliminated and drawing stays clean... Aluminum will not warp, crack, chip... peel or burn.

T-4-116...

Tool Holder

he Wesson multicut tool holder is gned especially for use on follower racer lathes. The holder is desig- d as the DTRL, signifying the use 55-deg diamond-shaped solid in- used on tracer lathes and having feature of being able to cut in er direction. Ample clearance is ided on both sides of the diamond ert to permit this multicutting action.

he new holder uses the Wesson damental band principle. The car- e insert is held by a tempered steel d, the only part of the tool holder ject to wear. This band is replace- e at a nominal charge. The new l provides a maximum cutting edge arance of 35 deg in straight shoulder ning, has two cutting edges and will from right to left or left to right. The insert can be turned end for end give the user two new cutting edges, king a total of four cutting edges each insert. Multicut tool holders n be used on either, or simultaneous- both sides of the work. They can locked in position right side up or side down. Locking, adjusting and anging of inserts is accomplished by justing screw on top of the holder hile the holder is in position.

T-4-1171

Monochromatic Light

Acme Scientific Co., 1457 W. Ran- olph St., Chicago 7, has recently in- roduced a new monochromatic light esigned specifically for making light ave measurements in the shop or lab- ratory. Used in conjunction with op- ical flats, the new light with its large, right working field, avoids the neces- ity of exact placement of the work, nd makes inspection easy and fast. Because it emits light of a single wave ength, the interference bands appear lear and sharp, and can be seen on a elatively dull surface or through an ppreciable air gap. The bands appear nly light and dark, and do not show n confusing rainbow colors as they o when ordinary white light is em- loyed.

Each interference band seen under he Acme monochromatic light means a ertical height change of 11.6 mil- ionths of an inch, and can be easily nterpreted to determine surface devia- ion from flatness.

T-4-1172

Furnace

The Cooley Electric Mfg. Corp., [illegible] dianapolis, Ind., announces the addi[illegible] of a new larger size type BL elec[illegible] box furnace to its line. Formerly av[illegible] able in three standard sizes, this f[illegible] nace is now offered with a chamber [illegible] of 15 x 12 x 30 in. This additio[illegible] size extends the capacity of this type [illegible] furnace to handle greater produc[illegible] and larger units of work.

The design of the BL furnace pr[illegible] vides some important new advantage[illegible] peculiar to this furnace alone. It em[illegible] ploys the Cooley embedded type of hea[illegible] ing unit which protects the heavy el[illegible] ment wire from atmospheric attac[illegible] The elements, formed in ceramic slab[illegible] are located in each side, the bottom[illegible] top, rear wall and the door of th[illegible] furnace to give a maximum and uniform[illegible] distribution of heat. In addition, ad[illegible] vantage is taken of the slab shape o[illegible] elements to cause them to act as baffle[illegible] walls. Unrestricted air spaces com[illegible] pletely surround the elements and a[illegible] natural air convection is thus created[illegible] further equalizing the temperatures.

T-4-1181

Press Lift Table

The maintenance of working level[illegible] at presses is accomplished with th[illegible] press feed Electraulic liftable manu[illegible] factured by Service Caster & Truck[illegible] Corp., Somerville, Mass.

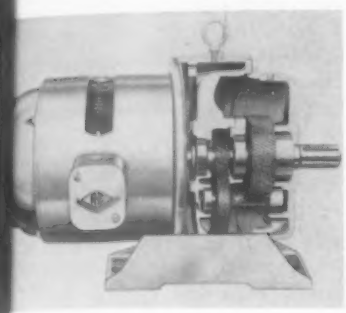
Designed to operate continuously with[illegible] production equipment, the Electraulic[illegible] tables are available in capacities up to[illegible] 15 tons. Efficient and labor-saving in[illegible] automatically feeding presses, the tables[illegible] may also be built to operate with the[illegible] press through but one set of controls.[illegible] The liftables are also valuable in re-[illegible] ceiving cut or stamped products after[illegible] processing.

Deck sizes of the machines vary from[illegible] 36 to 54 in. wide and 66 to 120 in. in[illegible] length. A raised height of 42 in. is[illegible] easily obtained from a lowered height[illegible] of 26 in. T-4-1182

Gear Reducer

This unit consists of a standard fluid-lift motor and gear train, designed in a single, compact unit. Its purpose is to convert the motor's conventional high speed into a slow-speed, high torque output. The integral fluid coupling provides cushioned starting of heavy loads and protection against jamming of equipment. Applications include cranes, conveyors, dryers, mixers, log pullers and other machinery where heavy loads require smooth acceleration at reduced motor speeds.

Features of this new Motoreducer unit includes a short lever arm length with minimum torsional stress.



The power-take-off shaft, gears and bearings are located immediately adjacent to the vertical centerline of the strong pyramidal base. Load pull is thus transmitted direct to the base, minimizing any lateral stress. Gear and bearing wear are reduced. Mounting in close quarters is made easier. All gears operate in an oil bath, assuring positive lubrication at all times. Helical gears are hobbed from special alloy steels, and have proved smoother, stronger and quieter than other types.

Standard Reuland Motoreducers are available with squirrel cage, fluid-shaft or slip ring driving motor, either polyphase or single phase. Gear train can be either single or double reduction. All are available in either drip-proof or totally enclosed designs. Output speeds from 1 to 600 rpm.

Made by the Reuland Electric Co., Alhambra, Calif. **T-4-1191**

Reproduction Process

Perma-Stat makes possible the reproduction of anything that is photographed, written, drawn or printed onto plastic, metal, wood, glass, leather or any other non-porous surface.

An emulsion, which is a bi-chromate stabilized gelatin, is applied to the material which is to receive the reproduction. The copy that is to be reproduced is photographed and the negative placed against the treated surface. Because the SG emulsion is sensitive only to concentrated ultra-violet rays, the negative is exposed briefly to a carbon arc lamp or an ordinary sun lamp. Ordinary daylight, incandescent or fluorescent light do not affect the SG emulsion, and no darkroom is required.

From there, a dip into the dye of the desired color, followed by a quick rinse in clear, cold water, and the Perma-Stat is completed. Any number of colors may be perfectly registered in sharply detailed form. No plates or screens are involved.

The SG emulsion has great affinity for the materials used and almost becomes a part of the material itself. It will not chip, fade, crack nor peel. It is impervious to hot or cold water, solvents and fungus growth, and not even fire will destroy the image if it is reproduced on a non-combustible material.

Among the uses to which the process may be applied are name plates, instrument scales, schematics and blueprints, permanent instructions, printed circuits, lubrication charts, advertising displays, posters, salesmen's portfolios, valuable documents and photographs.

More information may be obtained by writing to Trans-Gel Products, Inc., 212-40 Jamaica Ave., Queens Village, N. Y. **T-4-1192**

Fractional HP Motors

A line of fractional horsepower motors has been announced by the General Electric Co. Designated as Form G, the motors incorporate many radically different and advanced design features.

The motors are available in open dripproof and totally enclosed fan-cooled models in types K (polyphase), KC (capacitor start), KH (split phase) and KCP (permanent split capacitor). These have many applications on pumps, fans, blowers, compressors, office and home appliances, motor-driven tools of all sorts, etc.

The design incorporates a completely new insulation system developed especially for this project. It consists of a special nylon material combined with Formex wire and Glyptal varnish to give the motors longer life.

The Form G has new bearings, lubrication system, insulation, ventilation, mountings, windings, end shields, terminal board, and leads. In addition, the motors are engineered for dissipation of heat losses while retaining outstanding performance characteristics in comparison to their small size.

T-4-1201

Displacement Pump

The Magna-Mite, a positive displacement pump of compact size, is announced by Milwaukee Hydropower, Inc., 3447 N. 35th St., Milwaukee 16, Wis. With a capacity from 1½ gpm down to ¼ gpm, or less, this pump is suitable for handling fuel oil, gasoline, hydraulic fluid, lubricating oils and other light viscosity fluids.

The pump is generally similar to vane-type pumps in operation and construction, but has an important difference in that the conventional vanes are replaced by rollers. The rollers contact the outer case as in a roller bearing, and rolling friction replaces sliding friction between the vanes and the pressure chamber. As a result, the life of the pump is increased three to five times over that of ordinary type vane pumps.

The pump is furnished as standard with diametrically opposed ports having a ¼-in. pipe thread. Pumps are machined all over to close tolerances of 0.000-0.001 in.

The pumps have a practical speed range of from 300 to 3600 rpm. They are rated at 1750 rpm. T-4-1202

Oil Pump

De Laval-IMO A 313B pump has been announced by De Laval Steam Turbine Co., Trenton 2, N. J. This pump is designed to handle a wide variety of oil handling applications for pressures up to 275 psi.

This rotary positive displacement pump offers all the advantages of the IMO design. It has only three moving parts. It is reliable, quiet, pulsation-free, compact, excellent for high-speed operation. It can be used for capacities to 80 gpm, pressures to 275 psi and intermittent pressures up to 325 psi. This IMO pump handles light or viscous fluids in hydraulic systems, rotary and steam atomizing oil burners, lubrication, governing systems and similar services. **T-4-1211**

Revolving Joint

A light-running revolving joint for making air or hydraulic line connections to high-speed rotating clutches, chucks, and similar equipment features chemically inert "V" seal rings which have a low friction co-efficient, little affected by increases in pressure and remarkably free from scoring tendencies.

Connection to rotating machine or part is made by screwing the male threaded steel shaft of the joint into the hub of the chuck or clutch. The joint is offered with either right hand or left hand 1 in.—14 NF-2 straight machine threads for the rotating connection. Connection to the stationary end of the joint may be by standard ½-in. pipe or flexible hose. Use of hose is recommended to make a free-floating installation.

Overall length of the joint is 6-9/16 in. with wide spacing between the bearings. It is suitable for use at temperatures as high as 425 deg F, and speeds to as high as 1800 rpm, or more, under certain conditions. Information can be obtained from Barco Mfg. Co., Dept. J-31, 1801 Winnemac Ave., Chicago 40. **T-4-1212**

USE READER SERVICE CARD ON PAGE 101 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Chuck Adjuster

Precision adjustment of American standard chucks having serrated type jaws is said to be possible through use of the Jaw-Set, available from the Whiton Machine Co., New London, Conn.

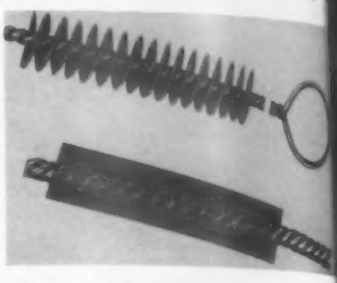
Designed specifically for use with any make of manual or air-operated chuck having serrated jaws as described in ASA Bulletin B 5.8—1936, the device features a single adjusting screw which controls radial movement of the top jaw in such manner as to give full tooth adjustment in either direction. This is also said to eliminate blind spots within the entire radial adjustment provided by the step-along feature of the American Standard serrated type chuck jaw.

Another advantage claimed for the new device is its ability to permit precision adjustment of individual top jaws without the time-consuming process of unlocking and locking individual operating screws or set screws.

The Jaw-Set is available for all American Standard chucks having serrated jaws in sizes ranging from 15 in. through 36 in. in diameter **T-4-1213**

Standard Brushes

The Mill-Rose Co., 1985 E. 59th St., Cleveland, has set up for the first time in the brush industry a total of 1,000 standard sizes of single and double spiral twisted wire brushes for hand and power operation. These standard sizes are stock items, available for quick



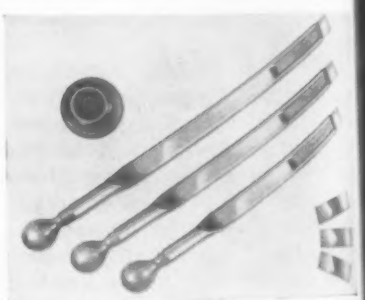
delivery. The range of sizes is complete, from ⅛ to 1 in. in diameter in single spiral for hand operation and from ¼ to 1 in. in diameter in double spiral for power operation, in 1/16-in. increments.

These standard items are the culmination of more than 30 years of specialization in the making of twisted wire brushes and in the development of special machines and techniques to insure a high precision product. Mill-Rose special abrasion resistant wire of high tensile strength is used throughout the line to insure long service life.

T-4-1221

Hand Scraper

Anderson Bros. Mfg. Co., Rockford, Ill. have developed a hand scraper for flat surfaces. This hand scraper is constructed of seamless tubing which makes it light in weight with just the right flexibility.



This model #5 scraper uses replaceable blades 1 3/32 in. in width by ⅛ in. thick. The blade is the same width and thickness throughout its entire length and after the blade is once sharpened, stoning is all that is necessary to maintain the cutting edge.

For operators who prefer placing the scraper against the body for additional leverage, a rubber pad is available to fit the round socket type handle.

To meet individual requirements, the scraper is made in three lengths. The length of the scraper is the overall length and measures 22, 20 and 18 in.

T-4-1222

Good Reading

A GUIDE TO SIGNIFICANT BOOKS AND PAMPHLETS OF INTEREST TO TOOL ENGINEERS

Manufacturing Processes, *by Myron L. Begeman. Published by John Wiley and Sons, Inc., N.Y. 16. Third edition, 608 pp; price $6.00.*

The third edition of this book has been revised to include the machines, processes and machine tools developed recently. The chapters on special casting methods, welding and allied processes, cold forming of metals, and plastic molding have been completely rewritten. The new material includes sections on continuous casting, Marforming, hydrodynamic forming, plastic molds, cold and stud welding, multi-station transfer machines, tracer-controlled machines, jigs and fixtures, and many recent automatic and semi-automatic machines.

The book itself is aimed at students and professional men engaged in production, industrial or tool engineering work. Included is detailed information on all important manufacturing processes and machines now available, along with details as to how they can best be applied, their advantages and drawbacks.

The first half of the book is devoted to foundry practice, pattern work, plastic molding, powder metallurgy, hot and cold working of metals, heat treatment and welding. The second half covers measuring instruments, cutting tools, machines and their accessories.

Plastics Molding, *by John Delmonte. Published by John Wiley and Sons, N.Y. 16. 493 pp; price, $9.00.*

The conversion of organic plastics materials into useful industrial products depends to a great extent upon adequate molding processes and equipment. Because the characteristics of organic plastics undergo marked changes during molding, considerable skill in applying equipment and a clear understanding of the chemical and physical changes that occur in these materials, must be acquired by the molder.

This book offers an analysis of the plastics molding industry and its equipment, as well as the principles and accessories that permit a molder to attain a high degree of versatility. Approaching the subject from an engineering viewpoint, the book considers first the flow of materials, and secondly the techniques for handling the materials once the flow has been properly established.

Technical Shorts . .

A DENT-PROOF, rust-proof automobile body is claimed as the result of experiments by the Glasspar Co. of Costa Mesa, Calif., and Naugatuck Chemical Division, United States Rubber Co. The body, constructed of Vibrin polyester plastic and layers of glass fiber is believed to be the first commercial production of a low-cost plastic automobile body. Currently, it is available in a single sports car design, which fits a frame with a 100-inch wheelbase.

The body is molded in one piece, with sides approximately two-tenths of an inch thick and weighs about 185 pounds. Strong and resilient, it is said to remain undented under the punishment of accidents which would normally result in crumpled fenders and doors. Resiliency causes the Vibrin-glass combination to spring back to original shape after impact.

Breaks are possible under heavy impact, the manufacturers say, but repairs are simple and inexpensive. To demonstrate these points, the body, mounted on a custom-built sports car chassis consisting of a special frame and supercharged engine, was driven into a tree at a speed of 25 mph. A crack approximately 14 inches long appeared at the point of impact near the windshield. The damage was repaired with a patch of glass fiber and plastic within one hour, according to the makers.

The car was shown to the public for the first time at the National Plastics Exposition in March.

AN ECONOMY tip from Texas Engineering and Manufacturing Co., Inc. is passed on concerning discarded power hack saw blades. That company uses the blades to trim sanding discs to the exact size of backing plates and reports a 50 percent saving in machine hours and as well as a considerable reduction in tool costs.

W. R. Lee, small tool repair employee at Temco, developed the process of sharpening the edge of a power hack saw blade that had been tossed away, wrapped the ends with tape for handles and used the tool as a draw knife to trim the discs. This process not only performed the operation in half the usual time, but left neater edges and completely eliminated not only the using up of rasps, but also did away with the wear on the backing plate which had been the result of former methods used. Previously, general industrial practice had been to file the discs to size with a wood rasp, which produced rough edges and wore out two to three rasps each week.

IN ITS RECENTLY published annual "Review of the Silver Market", Handy & Harman, fabricators of precious metals, indicated that the demand for industrial uses of silver continues in its growth.

Development in that company's laboratories some time ago of low temperature brazing alloys and silver solders was referred to as possibly being one reason, since it brought about wide-scale use of silver in industry in recent years. In many cases, the industrial use of silver brazing alloys has increased production in assembling parts with strong, leak-tight, ductile joints. At the same time, low flowing temperature and fast brazing action often are advantageous.

The Review reassured users by mentioning also that there is no apparent reason to fear inadequate supplies in the near future, even if defense spending is stepped-up and the use of silver is substituted for scarce metals.

TRADE LITERATURE

Free Booklets and Catalogs Currently Offered By Manufacturers

...cing Calculator

...ding calculator simplifies selection ...act ton-pressure for piercing a giv... ...ize hole in any thickness and type ...metal; designates pressure in tons ...holes ranging from 3/16 to 10 in. in ...meter, and 1/2 to 30 in. in perimeter, ...ng into consideration whether metal ...heet aluminum, rolled zinc, brass, ...per, 0.25 or 0.50 percent cold rolled ...et carbon steel, 1.00 percent carbon ...ng steel or stainless. **Ward Ma...nery Co.**, 564 W. Washington ...d., Chicago. **L-4-1**

... Sets

...Twelve-page booklet, "Save Tooling ...ne" presents tooling advantages in ...h time and cost reductions offered ...ough company's precision die sets; ...ailed discussions cover four major ...tors involved in die set convenience ...d efficiency—wide range for selec...n, prompt delivery, precision and ...cial modifications to accommodate ...usual dies. **Danly Machine Speci...ties, Inc.**, 2100 S. Laramie Ave., Chi...go 50. **L-4-2**

...rbide Tools

...Brochure, No. 108, covers line of tools ...de by this well-known maker of ce...nted tungsten carbide; dimensional ...awings and tables of prices, specifica...ons, and as well as standard tolerances ...hered to, included for each type tool; ...chnical data sections present other ...rtinent information, such as speed ...d feed recommendations. **Newcomer Products, Inc.**, Latrobe, Pa. **L-4-3**

...achine Tools

...Catalog G-52 carries complete de...cription and photos featuring exten...ve line of engine lathes, boring mills, ...illing machines, drill presses, radial ...rills, shapers, surface grinders, uni...versal tool and cutter grinders, gear ...obbers and shears; information on ...imensions and capacities included. **...arker Machine Co.**, 158 Pioneer St., ...Brooklyn 31, N. Y. **L-4-4**

...crew Machines

...Technical bulletin, 500-C, covers ...odel "C" automatic roll marker for ...crew machines demonstrates simple ...anner in which it can be used to ...iminate secondary operations, improve ...arking clarity and reduce costs; in...udes instructions for operation set-up, ...se of offset dies, etc. **New Method ...teel Stamps, Inc.**, 147 Joseph Campau ...St., Detroit 7. **L-4-5**

Abrasive-Belt Machines

Widely illustrated brochure presents case studies of successful abrasive-belt machining applications and operations in addition to basic facts of this type work and its relative advantages; explanatory drawings give precise information on differences of the five types of abrasive-belt machining. **The Porter-Cable Machine Co.**, Syracuse 8, N. Y. **L-4-6**

Measuring, Testing

Eighty-page catalog presents under one cover all of G-E's testing and measuring equipment for laboratory and production line use; primarily a reference to the apparatus available for complex measurements; photos and diagrams help describe the uses, features, specifications; prices included for more than 130 items. **General Electric Co.**, Schenectady 5, N.Y. **L-4-7**

Testing Instrument

Bulletin explains construction, pointing out special features and their value, operation, and advantages of recording oscillograph for testing and recording photographs, diagrams and tables clarify points. **Consolidated Engineering Corp.**, 620 N. Lake Ave., Pasadena 6, Calif. L-4-9

Presses

Catalog 30-A presents complete line of hydro-dynamic presses; includes sections devoted to single- and double-action housings and open-rod presses, special function presses, material handling devices and hydraulic cushions. **E. W. Bliss Co.**, 1375 Raff Rd., Canton, Ohio. L-4-9

Gages

Widely illustrated brochure deals with P&W magnetic gages for continuous gaging, explaining their uses and advantages; gives details of construction and particular features of design. **Pratt & Whitney** Div. Niles-Bement-Pond Co., West Hartford 1, Conn. L-4-10

Motors

"Allis-Chalmers Totally-Enclosed Fan-Cooled Motors With Tube-Type Air-to-Air Heat Exchangers," 51B7149B, discusses construction features and details of these products, in ratings from 40 hp at 600 rpm through 800 hp at 3600 rpm, in both standard and explosion-proof designs; illustrated. **Allis-Chalmers Mfg. Co.**, 1004 S. 70th St., Milwaukee. L-4-11

Grinding

Series of 32 illustrated grinding bulletins deal with methods, problems, proper equipment for various kinds and types of jobs, effects of stress, care of tools, safety, causes and corrections of common errors and other informational and educational material on abrasives, grinding, polishing. Form A-1204. **The Carborundum Co.**, Niagara Falls, N.Y. L-4-12

Valves, Air Control

Wiring diagrams and dimensional drawings, plus explanatory photos of disassembled model show the main points of Bellows' recently introduced explosion-proof "Electroaire" air control valve; text discusses operation and advantages. **The Bellows Co.**, 230 W. Market St., Akron, Ohio. L-4-13

Safety Hand Tools

Illustrated 4-page folder ST-5 contains factual information concerning materials, construction and usage of safety tools such as wrenches, hammers, chisels, pliers, etc., representative of Ampco line; includes sizes, weights and other descriptive data. **Ampco Metal Inc.**, 1745 S. 38 St., Milwaukee 46. L-4-14

North East West South IN INDUSTRY

Donald L. Taylor has been named manager of general developments in the development and research department of **Hooker Electrochemical Co.** In this capacity Mr. Taylor will be concerned with general expansion of the company's operations. He has been with Hooker Electrochemical since 1936 as a chemical engineer and project leader.

John K. Beidler was appointed general manager of the Machinery Division of **Dravo Corp.** at a meeting of the firm's board of directors. At the same time he was elected a director and a vice-president of Dravo-Doyle Co., a subsidiary. Mr. Beidler, who joined Dravo in 1935, fills the vacancy in the general managership created by the recent death of Walter P. Berg.

Recent changes in the company organization of **The Fellows Gear Shaper Co.** included the election of **Edward W. Miller**, president, to the post of general manager as well; and of **Edwin R. Fellows, II**, as a director and assistant general manager. Mr. Fellows will continue to serve as manager of the export department.

Two recently established departments of **General Electric Co.** have been given general managers during the past few weeks. **John C. Helies** has been named head of the appliance control department, a part of Component Products division; and **Carl A. Salmonsen** has been put in charge of the industry control department, a part of the Switchgear and Control division. Mr. Helies previously was manager of manufacturing for the vacuum cleaner and fan department of G-E's Small Appliance division, while Mr. Salmonsen was formerly manager of manufacturing of the firm's former Large Apparatus division.

In an announcement from **Loewy Construction Co., Inc.,** a subsidiary of Hydropress, Inc., **A. Guilbert Formel** was named projects manager for heavy hydraulic presses, die forging and extrusion plants. Mr. Formel was formerly connected with the Preload Corp., Ford, Bacon and Davis, Inc., and E. B. Badger & Sons Co.

Earlier, it was announced that **Howard Terhune** had joined the Loewy corporation as project design engineer in charge of the counter-blow hammer division. Mr. Terhune has been specializing in the design, engineering and sale of drop hammers, forging equipment and heavy presses for the past 45 years.

Axelson Manufacturing Co. has announced the election of **Victor Mancuso** as executive vice-president and assistant general manager. Mr. Mancuso, who has been associated with the Axelson firm since 1917, previously has held positions of shop superintendent, works manager and vice-president in charge of manufacturing.

Claude R. Morgan has joined **Cone Automatic Machine Co., Inc.,** to take charge of that firm's program of carbide tool development. Mr. Morgan has been associated with the General Electric Co., from whom he received a managerial award. He was superintendent of the bar and chucking machine division at Pittsfield, Mass.

J. H. Tredinnick, has been made executive vice-president of **E. W. Bliss** Co. A director of the company for the past three years, Mr. Tredinnick was formerly vice-president in charge of the Hastings, Mich., division.

At the same time, **Robert Shannon,** who previously had been assistant manager, was appointed manager of the Hastings division.

The board of directors of **The Carborundum Co.** has elected **Clinton F. Robinson** president and director of the company to succeed **H. K. Clark** who recently resigned as president. Mr. Clark will continue with the company as a member of the board of directors. **Paul B. Brown, Clarence E. Hawke** and **William H. Wendel,** formerly managers of the bonded products and grain division, refractories division, and coated products division respectively, were elected vice-presidents in charge of their divisions.

In addition to a distinguished military career from which he retired as a major general in 1948, Mr. Robinson is former president of Frederic B. Harris Co. and currently is director and member of the executive committee of Fansteel Metallurgical Corp.; director and member of the executive committee of R. P. Bennett Co., and director of American Metallic Corp.

Clinton Robinson

Everett Hicks

At the 67th annual stockholders' meeting, **Everett M. Hicks** was elected vice-president and a director of **The Norton Company.** He remains manager of the company's grinding machine division. Mr. Hicks also became a member of the company's executive committee on which he has served several years in an advisory capacity.

At the same time, **Frank W. Smith,** who had retired earlier from active participation in management of Norton's grinding machine division, also retired from the board. Mr. Smith remains a vice-president and is being retained as consultant on the company's machine tool construction projects.

Also recently announced by Norton was the appointment of **George A. Fyrberg** as production manager of the company's abrasive division. Mr. Fyrberg, who began his Norton career in 1915, succeeds **Harold C. Dunbar** who retired after 39 years with the organization.

P. J. Musolf was elected vice-president and factory manager of **Sunbeam Corp.** at a recent meeting of the company's board of directors. Mr. Musolf, who joined Sunbeam as chief engineer 21 years ago has successively held the positions of master mechanic in charge of all tooling, assistant plant superintendent, and plant superintendent.

Two engineering specialists have been appointed to the staff of **Remington Rand** laboratory for advanced research. **Commander John O'Shea,** retired naval officer, previously was manager of the special products division of Thomas A. Edison, Inc. **Colonel Ivan Sattem,** formerly an associate professor of engineering at the U.S. Military Academy was recently chief engineer with the New York State Power Authority. Both men will be special assistants to Lieut. General Leslie R. Groves, vice-president in charge of the laboratory.

Appointment of **S. L. Johnson** as manager of the New Methods Development division of the "3M" coated abrasives division was announced by **Minnesota Mining and Manufacturing Co.** Mr. Johnson in this capacity will direct the division in developing new machinery and techniques for conditioning carbon and alloy steels, and in developing improved methods for grinding and finishing other metals.

OBITUARIES

Morris E. Leeds, founder and chairman of the board of **Leeds & Northrup Co.,** died recently at the age of 82. Among the many organizations who had honored Mr. Leeds during his lifetime were the Institute of Management which gave him its Henry Lawrence Gantt Medal for industrial relation achievements; American Institute of Electrical Engineers which awarded him the Edison Medal for development and production of instruments and controls; Franklin Institute which gave him the Edward Longstreth Medal for invention of the instrument known later as the Leeds Recorder.

Joseph R. Williams, product manager of pavers and portable mixers at **Worthington Pump and Machinery Corp.'s** Dunellen, N. J., plant died recently. Mr. Williams, who was 57 years old, joined the Ransome Machinery Co. in 1923 and was made product manager of the paver section when that company became a division of Worthington nine years ago.

Coming Meetings

Mar. 22-Apr. 6, Chicago International Trade Fair. Navy Pier, Chicago.

Apr. 7-9, Annual meeting **American Society of Lubrication Engineers.** Statler Hotel, Cleveland.

May 1-7, International Foundry Congress and Show, sponsored by **American Foundrymen's Society,** Atlantic City.

May 5-16, British Industries Fair. London and Birmingham, England.

Abstracts of Foreign Technical Literature

By M. Kronenberg

Great Britain: The manufacture of parts for compressed air valves involves the machining of many accurate seatings on the ends of bushings and valves and special tools are often required for these machining operations. R. W. Nelson discusses the recent development in spiral trepanning tools in the British edition of *Machinery* of January 10. The form of the helical end face of such cutters may be produced on a milling machine, using an engraving type cutter, or the form can be made on a screw-cutting lathe by means of a flat tool.

Tungsten carbide is now being applied with success to blanking and piercing tools. In the progressive tool, where the operations are split into stages, the punch can be made more robust according to a paper published by K. L. Pickett in the British edition of *Machinery* of January 24 and January 31. Appropriate conditions regarding application of these tools are found in the electrical and the razor blade industries, where continuous jobs are encountered. One million to one and a half million razor blades of 0.005-in. thickness usually can be produced per grind with tungsten carbide tools as against a hundred thousand blades per grind in the case of high-speed steel tools. In the electrical industries, on transformer and rotor laminations, carbide tools are producing up to thirty times as many parts as steel tools are, whereas the cost of the carbide tools is about four times as great.

For several years after the war, the machine tool industry in Japan experienced a depression due to the limitations on production imposed on Japanese industry as a whole as discussed by John S. Young in the British edition of *Machinery* of January 17.

Early in 1951 the situation began to change and the building of machine tools was gradually resumed on a small scale. The present capacity of the Japanese machine tool industry is 18,000 tons per year, split up among about 40 manufacturers (there are about ten times as many in the United States). The readiness of the Japanese industry to adopt progressive methods is indicated by the fact that one manufacturer has 100 copying lathes on order. Ten percent of the production

s exported to Formosa, India, Thailand, Mexico, Australia and the Philippines. The general design is similar to American and European products and frequently represents a combination of both.

No particular improvement of Japanese origin is observed, but considerable attention is given to the application of hydraulics. The castings are said to be of high quality and finish. The machines are equipped with ample electric power, and vertical boring mills up to 96-in. swing are being built.

A great deal of information on the performance of rolling mills may be obtained by measuring the load on the work rolls. This information is equally important to the user and builder of such mills and to the manufacturers of roll-grinding equipment.

Many attempts have been made in the past to produce a load meter whereby either hydraulic cylinders or piezoelectric effects or electromagnetic methods were employed. A new design recently developed by the British Iron and Steel Research Association is discussed by R. B. Sims, J. A. Place and A. D. Morley in *Engineering* of January 25. The new instrument does not increase the mill spring materially. It is essentially a steel cylinder placed between the loading screw and the top roll bearing. Electric strain gages bonded to the cylinder surface are used to measure the applied load.

France: It is a well-known fact that the tool life of machine-ground twist drills exceeds that of hand-ground drills by about 200 to 300 percent. R. J. Sack has investigated these differences and reports on them in *La Machine Moderne* published in December 1951. He indicates that the thrust of machine-ground twist drills is about 40 percent less and the torque about 25 percent less than that of hand-ground drills. The author also discusses various items that should be taken into consideration in the grinding of twist drills, namely the grinding of special points, grinding wheels and drills for deep holes.

The laboratory of the French Machine Tool Industry *(La Station d'Essais de Machine Outils)*, which was established in Paris during the war, is now open to manufacturers and users of machine tools according to an article by Champier and Janvier published in *La Machine Moderne* of January 1951. The equipment permits testing of machine tools for accuracy, efficiency, vibrations, cutting forces, tool life and other features usually not tested in the experimenting stations of the individual manufacturer.

Switzerland: Color conditioning of machine tools in manufacturing plants has been adopted by the Swiss industry

according to two papers published in the January issue of *Industrielle Organisation*. The first article, by W. Voge[illegible] deals with the concept of color, the natural colors of materials, the synthetic colors, color stimulants, color schemes for manufacturing plants. The other paper, by F. Baierl, deals with the problem of "Light and Color as a Means for Increasing Production." Tests which were run at different places confirmed the findings in the American industry to the effect that color conditioning increases the efficiency of a plant or of an operator by 15 to 25 percent.

The author discusses in detail light and color distribution, color contrasts, light-shade contrast, effect of the size of the workpiece, effect on accuracy, safety and neatness of the working place.

Germany: The present standards for German high-speed steel tools and their chemical compositions are discussed in an article by H. Briefs published in *Werkstatts Technik und Betrieb* in January. The tabulation shows six classes of high-speed steels with medium tungsten content (9 to 12 percent), four classes with high tungsten content (18 percent) and three classes with molybdenum-tungsten alloys. In view of the difficulties involved in the securing of tungsten, it was necessary to postpone the manufacturing of high tungsten tools. A cobalt containing tool steel (5 percent) has been used instead for the machining of materials of high-tensile strength.

The author also discusses tests run in Germany with deep freezing of tool steels; they were not satisfactory and have been abandoned. Chromium plating was found to be advantageous in cases where the tools were operating at relatively low temperatures such as in reamers (about 550 deg F). At higher temperatures chromium plating usually caused a loss in hardness.

Indexing fixtures with horizontal spindles which may be used on milling machines have been developed by O. Ziegener according to an article published in the January issue of *Werkstattstechnik und Maschinenbau*. He indicates that in this way it is possible to save the more expensive dividing head for high-accuracy work.

In the same issue an article is also published by J. B. Armitage and A. O. Schmidt covering cutting force and horsepower requirements in the machining of metals as presented by the authors before the Dayton Chapter of the American Society of Tool Engineers. They examine particularly the problem whether or not a change in cutting speed causes a change in cutting force.

DoALL

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DoALL BAND FILER SAVES TIME, TOOLS, LABOR

Four to Nine Times Faster Than Other Methods, Requires No Special Skill

DoALL Band Filing offers unusual opportunities for reducing costs and increasing production on a wide variety of internal and external filing jobs. The operation is similar to vertical band sawing. The band file, consisting of file segments riveted to a flexible steel band, travels continuously in one direction only, cutting all the time. Filing speed is four times that of jig filing, about nine times that of hand filing. Because there is no backstroke to cause wear and tear, the file bands last longer than jig or hand files.

No special skill is required to operate the band filer. The operator simply guides the work into the file. DoALL Selection Charts tell him which of the wide range of file bands, and what band speed, to use to secure the maximum cutting rate consistent with desired tool life and required finish. The infinitely variable speed range of the DoALL Band Filer is of great value here, permitting the optimum speed for any of the wide range of metals, including new alloys, being used today.

Case Studies

Users reports indicate the savings possible in various applications of band filing. In a large foundry one man is now band filing seven times as many castings as he formerly filed by hand. In another plant 90% of the filing operation on a punch, die and guide plate was being done with a jig file and the remaining 10% by hand. Now a DoALL Band Filer does the job four times as fast as the jig filer and eliminates most of the hand filing.

Often a DoALL Band Filer can do jobs such as slotting or notching and thereby release milling machines, broaching machines and shapers for other work. One plant is now band filing flats on shafts and has released for other work the expensive milling machine formerly used for the operation.

Low capital investment and low operating costs make the DoALL Band Filer a logical addition to any shop where production filing is done. Band filing can also be done with other models of DoALL band machines.

The DoALL Research Laboratory is equipped to run band filing tests on sample pieces submitted and will issue a complete report on the results secured. A Band Filer demonstration will also be conducted at any plant requesting it.

No special skill is required to operate a DoALL Band Filer.

Wide Range of Sizes of DoALL Flat Stock Save Money for User

The 238 sizes of DoALL precision ground oil hardening, flat stock make it possible for tool steel users to purchase the size best suited to their needs and thereby eliminate waste and reduce costs of making tools, dies, parts or gages. Delivery at present is prompt on all 238 standard sizes carried. Special sizes are also obtainable.

* * * *

There are 32 DoALL Sales-Service Stores in the United States, two in Canada and one in Mexico, equipped to conduct free demonstrations of DoALL products in any plant upon request.

. . . CAN YOUR SURFAC

"Our DoALL Grinder is 50% faster than previous machine and tool life is increased 30% because of better finish", says Reltool Corporation, Milwaukee, Wisconsin.

Rigid DoALL Surface Grinders Can Take Heavier Cuts and Produce Precision Work Faste

TRY THE TEST illustrated at the right. Take the heavy cut, rever the crossfeed and let the wheel run back over the ground surface. If sparks it is grinding again, showing that the wheel didn't take the f depth of cut on the first pass. If it is a DoALL Grinder it won't spar in fact, if you stop the work under the wheel and shut off the mot the wheel will coast to a stop without touching the work surface.

Now, pencil mark the work surface. Lower the wheel .0001", sta the grinder and the wheel will erase the pencil mark.

There is proof of the rigidity and precision of a DoALL Grinde There is why it will do a given job in less time. You can take heavier cut without "give" in the spindle or the table. The whe doesn't climb over the work piece—it cuts true in one pass. Ther is no back-lash, slop or hang-up in the vertical column—you ca control the vertical feed to lower the wheel as little as .000 even after a heavy cut.

And, with DoALL "Cool-Grinding"* you can take full advanta of this rigidity and precision—take the heavier cuts without bur ing the work—get a better finish and sharper edges. Coola flows in at the hub, *through* the wheel and out *at the point of conta* in a fine mist. There is always coolant where the heat is generate unlike flood cooling where the wheel blasts the coolant aw from point of contact.

There is a DoALL Surface Grinder with hand or hydrauli crossfeed for every toolroom or production requirement. Ca your local DoALL Sales-Service Store today or write:

THE DoALL COMPANY

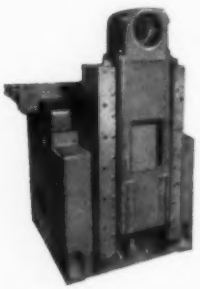
254 N. Laurel Ave., Des Plaines, Illinois

35 Local Sales-Service Stores in North America

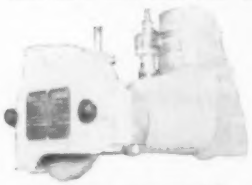
* U.S. Patent No. 2470350. Available as extra equipment on all DoALL Surface Grinders.

GR-6

HERE'S WHY DoALL PRECISION HYDRAULIC SURFACE GRINDERS ARE FASTER, MORE RIGID, MORE ACCURATE!



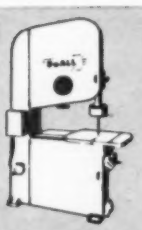
MASSIVE FRAME —column support and base are single-piece chrome nickel steel casting, strongly ribbed for great rigidity.



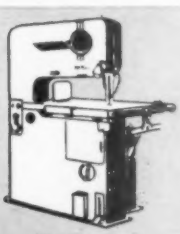
HUSKY SPINDLE SUPPORT, dowelled and bolted to column, prevents wheel from chattering or springing away from work.

VERTICAL FEED INCREMENTS .0001"—made sible by ridigity precision of long 30" colum

CONTOUR-MATIC



ZEPHYR

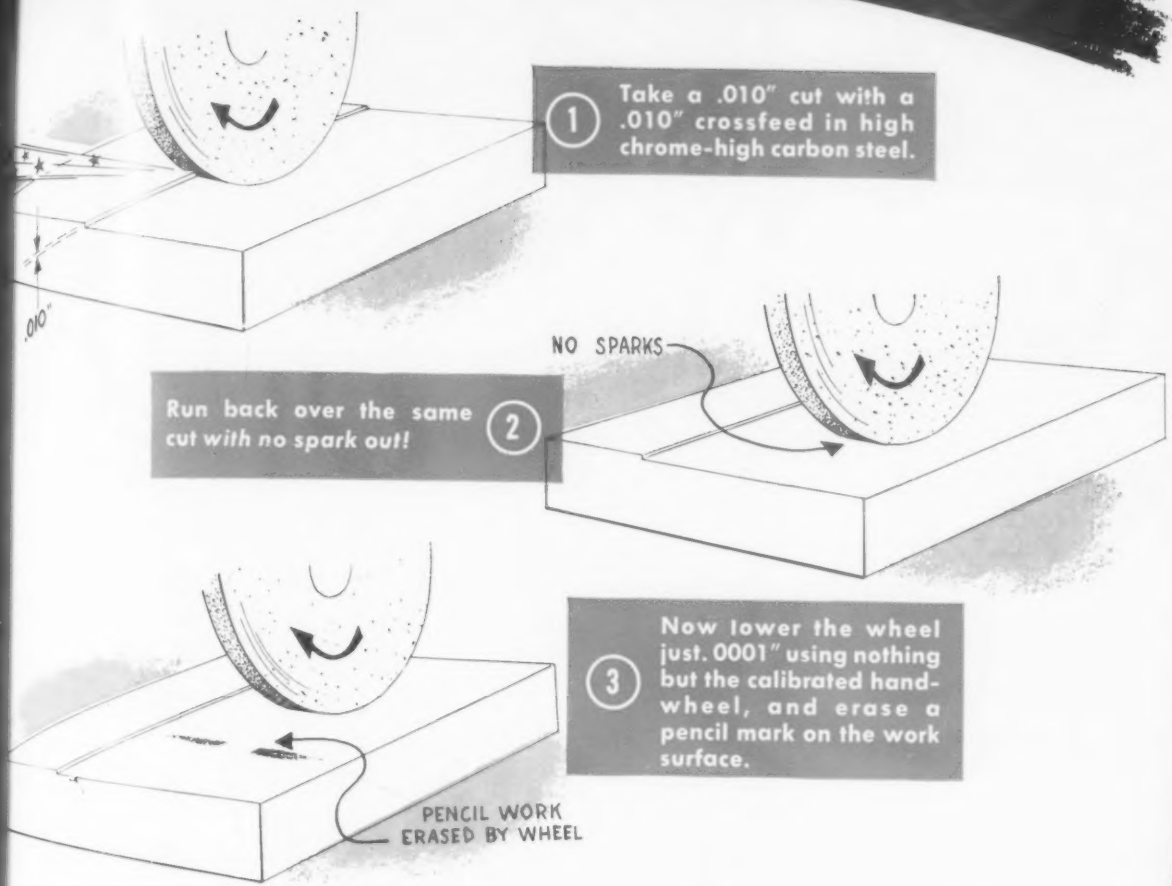


CONTOUR

BAND FILER

SAW BANDS

RINDERS DO THIS?

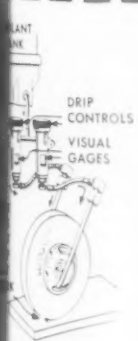


1. Take a .010" cut with a .010" crossfeed in high chrome-high carbon steel.

2. Run back over the same cut *with no spark out!*

3. Now lower the wheel just. 0001" using nothing but the calibrated hand-wheel, and erase a pencil mark on the work surface.

You can see the above test as part of a complete demonstration of a DoALL Precision Surface Grinder right in your own plant, without cost or obligation. Call your local DoALL Sales-Service Store today.



"COOL-GRINDING" ATTACHMENT— reduces cutting temperature as much as 400°F; prevents burning, warpage, checking, skin softness.

FULL HYDRAULIC *DRIVE* of table and crossfeed, not merely a hydraulic *control* of a mechanical drive. Smoother, longer-wearing, quieter; more uniform motion for smoother finish, greater precision.

DoALL

Ask for Descriptive Bulleti


BOLROOM GRI


CRUSH GRINDER


GAGING EQUIPMENT


MONOLITE


MOBILE INSPECTION UNITS


TOOL STEEL

DoALL Saw Bands Unconditionally Guaranteed

83 Inspections Assure Absolute Certified Quality

"Absolute satisfaction as to quality or replacement at no cost," is the guarantee that goes with every DoALL saw band. The most exacting quality control standards are maintained by DoALL. Special alloy steel for DoALL saw blades is subjected to rigid tests for thickness, width, camber, wedge, lip, edge roughness, edge radius, Rockwell hardness, weldability, cracks, brittleness, tensile strength, yield point, carbide size and distribution. Inspection is **certified** by tagging the tested samples. This record follows the steel throughout manufacture to the ultimate consumer. Many more laboratory, visual and mechanical inspections are carried on during the operations of toothing, setting, heat treating, tempering and on into packaging—during which, other samples are taken and subjected to re-examination. These are but a few of the many inspections that make DoALL saw bands the finest quality blades obtainable for any vertical or horizontal band sawing machine or cut-off saw.

Checking a DoALL saw band sample for accuracy of set with an optical comparator.

New Plastic Box Announced for 83 Piece DoALL Gage Block Sets

An attractive, warp-proof, moisture-proof, jet black plastic box is now being used to house 83-piece DoALL gage block sets. This box is designed to accommodate the blocks in a standing position for easier accessibility. It also has a new "double catch" safety feature. Both catches have to be snapped before the box will open, a safety feature which requires that the box be placed on a bench before it can be opened. This prevents accidental opening of the box and dropping of blocks while carrying from one place to another.

The hinged cover of the box is made to lie flat to provide a tray for safely holding blocks and accessories while in use.

Helpful information regarding use, temperature control, identification, calibration, general care and service of DoALL blocks is found on a label affixed to the underside of box cover.

The new plastic boxes are available separately to present owners of 83-piece gage block sets who wish to replace their wooden containers.

CALL DoALL locally at these Sales-Service Stores

BALTIMORE 12, MD.
5621 York Rd.
Call DoALL: Hopkins 5340

BIRMINGHAM 4, ALA.
800 N. 24th St.
Call DoALL: Birmingham 3-0502

BROOKLINE 46, MASS.
89 Washington St.
Call DoALL: Longwood 6-9555

CEDAR RAPIDS, IOWA
624 Fifth St., S.E.
Call DoALL: Cedar Rapids 3-0616

CHARLOTTE 2, N. C.
405 S. Mint St.
Call DoALL: Charlotte 4-2579

CHICAGO 39, ILL.
4650 W. Fullerton
Call DoALL: Albany 2-5300

CINCINNATI 2, OHIO
536 Sycamore St.
Call DoALL: Main 3929

CLEVELAND 3, OHIO
6517 Euclid Ave.
Call DoALL: Express 1-1177

DALLAS 2, TEXAS
1628 Industrial Blvd.
Call DoALL: Sterling 3819

DAYTON, OHIO
725 S. Main St.
Call DoALL: Michigan 2121

DETROIT 27, MICH.
15010 Plymouth Rd.
Call DoALL: Broadway 3-4141

DENVER 4, COLO.
1187 Stout St.
Call DoALL: Alpine 7444

GRAND RAPIDS 7, MICH.
410 Hall St., S.E.
Call DoALL: 5-2191

HARTFORD 5, CONN.
45 Farmington Ave.
Call DoALL: Hartford 5-6664

HOUSTON 2, TEXAS
121 St. Emanuel
Call DoALL: Capital 6588

INDIANAPOLIS 2, IND.
1401-3 N. Illinois St.
Call DoALL: Plaza 6496

JACKSONVILLE 7, FLA.
1106 Kings Ave.
Call DoALL: Jacksonville 9-7087

KANSAS CITY 6, MO.
1019 E. Truman Rd.
Call DoALL: Harrison 5857

LOS ANGELES 21, CALIF.
1316-18 S. Santa Fe
Call DoALL: Trinity 3871

MILWAUKEE 5, WISC.
2427 W. North Ave.
Call DoALL: Division 2-2950

MINNEAPOLIS 14, MINN.
2510 University Ave., S.E.
Call DoALL: Gladstone 1173
St. Paul—dial red "O" for Zenith 2399

NEW YORK 10, N. Y.
67 Lexington Ave.
Call DoALL: Murray Hill 4-1514

NUTLEY 10, N. J.
88 Park Ave.
Call DoALL: Nutley 2-6767

PHILADELPHIA 24, PENNA.
2053 E. Glenwood Ave.
Call DoALL: Cumberland 8-7400

PITTSBURGH 21, PENNA.
600 Rebecca Ave.
Call DoALL: Fremont 1-5200

ROCHESTER 5, N. Y.
215 Central Ave.
Call DoALL: Hamilton 8420

ROCKFORD, ILL.
123 Seventh St.
Call DoALL: Rockford 47848

SAN FRANCISCO 3, CALIF.
952 Howard St.
Call DoALL: Garfield 1-4784

SEATTLE 22, WASH.
520 E. Pike St.
Call DoALL: East 7500

ST. LOUIS 6, MO.
1945 N. Broadway
Call DoALL: Central 3620

TOLEDO 6, OHIO
2952 Monroe St.
Call DoALL: Garfield 8309

TULSA, OKLA.
207 W. Archer St.
Call DoALL: 35443

CANADA

MONTREAL, QUEBEC
583 Inspector St.
Call DoALL: University 1264

TORONTO 10, ONTARIO
37 Clarkson Ave.
Call DoALL: Redfern 1238

MEXICO

MEXICO CITY, D. F.
Maestro Antonio Cas[illegible] #48
Call DoALL: Mexica[illegible] 36-27-95
or [illegible]

No. 3—88M—3-52

PRINTED IN U.S.A.

Using a special rotary fixture, the Le Roi Company taps Class 4 threads in one operation on a Warner & Swasey No. 12 Precision Tapping and Threading Machine.

Class 4 threads at one pass!

AND SCRAP LOSS LESS THAN 1%

A HIGHLY ACCURATE tapping job—a ½-20 thread to Class fit through a 9/16" crankshaft flange—is required in manufacturing industrial gasoline engines at the Le Roi Company, West Allis, Wisconsin. This important job, done by the previous method, required a rough tap by machine and then finish by hand. And despite operators' care and skill, one crankshaft in every ten had to be scrapped.

When a Warner & Swasey No. 12 Precision Tapping and Threading Machine was put on this same job, Le Roi cut scrap losses to the vanishing point—less than 1%. And this accurate machine taps the Class 4 fits in one pass, eliminating all costly handwork.

It wasn't too long ago that it would have been considered impossible to cut Class 3 and 4 threads consistently by machine alone. But results at the Le Roi Company bear out the experience of hundreds of plants where Warner & Swasey Precision Tapping and Threading Machines have set new standards of accuracy.

If you have tough tapping or threading jobs, in hard or soft metals or plastics, let a Warner & Swasey Field Engineer show you how a Precision Tapping and Threading Machine can help you cut scrap losses and get better, more profitable production.

WARNER & SWASEY
Cleveland

YOU CAN MACHINE IT BETTER, FASTER, FOR LESS WITH WARNER & SWASEY TURRET LATHES, AUTOMATICS AND TAPPING MACHINES

A multiple air gage application for checking internal diameter, over-all length, and squareness of bore to face of an oil pump gear.

When you want

FASTER

More Economical Gaging

Buy a Taft-Peirce CompAIRator Air Gage

Fast Recordings! Indications are virtually instantaneous even at many feet from the unit.

No Falling Off of Pointer! There is no flutter. Pointer action is positive. Repeatability is excellent. Novel tolerance markers speed reading.

Use Untrained Operators! Since *measurement is made without mechanical contact*, anyone who can read a dial can operate a Taft-Peirce CompAIRator.

Ultra-Sensitivity! Variations such as taper, out-of-roundness, bell-mouth, barrel shapes (normally undetected by ordinary gages) are shown instantly.

Constantly Accurate! Vibration, jarring — even tilting — do not disturb accuracy. Nor does coolant flow or sludge on parts, air stream automatically clears the surface.

Less Expensive To Operate! Taft-Peirce CompAIRators are built to withstand the hard knocks and wear and tear of shop use. Their rugged construction eliminates expensive maintenance. Air consumption is less than 10 cubic feet per hour.

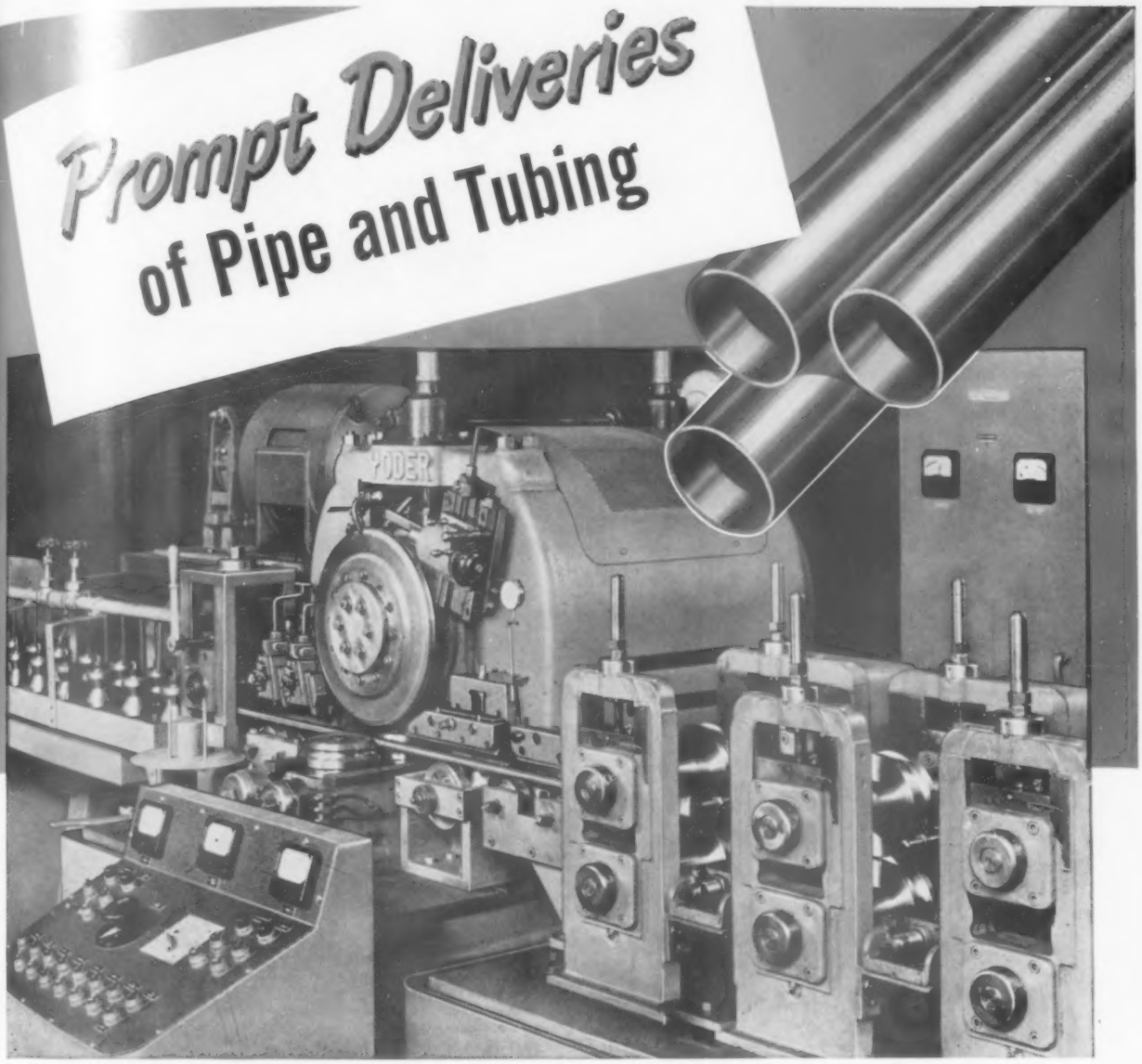
Readily Portable! Only 7″ wide, 8″ high, 7½″ deep, the Taft-Peirce CompAIRator is easy to carry and handle. Even the regulator (to eliminate variations in air supply) and the filter (to remove moisture, oil, and other foreign matter) are inside the case.

Wide Range! Standard dials are available for .001″, .002″, .003″, .004″ and .008″ ranges on a 180° five inch arc. Amplifications are 5000 to 1, 2500 to 1, 1875 to 1, 1250 to 1, and 625 to 1 respectively. Special scales can be furnished on order. And two simple changes requiring only a few minutes time converts a Taft-Peirce CompAIRator from one amplification to another.

Write Today for This Bulletin

The TAFT-PEIRCE Manufacturing Co.
WOONSOCKET, RHODE ISLAND

Prompt Deliveries of Pipe and Tubing



may be realized by installing a low-cost Yoder Cold-Roll-Forming, Electric-Weld Tube Mill. Cold or hot rolled strip is fed continuously into the mill, coming out as finished pipe or tubing, automatically cut to length.

Yoder mills are notable for their low first cost, high speed, low labor and maintenance cost. They offer not only the highest production per dollar of investment, but for most requirements also the lowest conversion cost per ton, in making sizes from ¼″ up to 30″ diameter.

Through recent exclusive Yoder developments, higher production is now obtainable than ever before. For sizes up to 3″ dia., speeds up to 250 fpm are obtainable with a Yoder-Tocco induction welder incorporated in a Yoder mill.

For making the largest sizes, when tonnage requirements are not too high, the initial investment may be greatly reduced with a Yoder Press-forming, Arc-weld mill.

Yoder offers you the widest choice of mills of proven performance. Over 150 Yoder Pipe and Tube Mills are now in successful operation all over the world.

Literature and further information on request.

THE YODER COMPANY • 5527 Walworth Ave., Cleveland 2, Ohio

Complete Production Lines

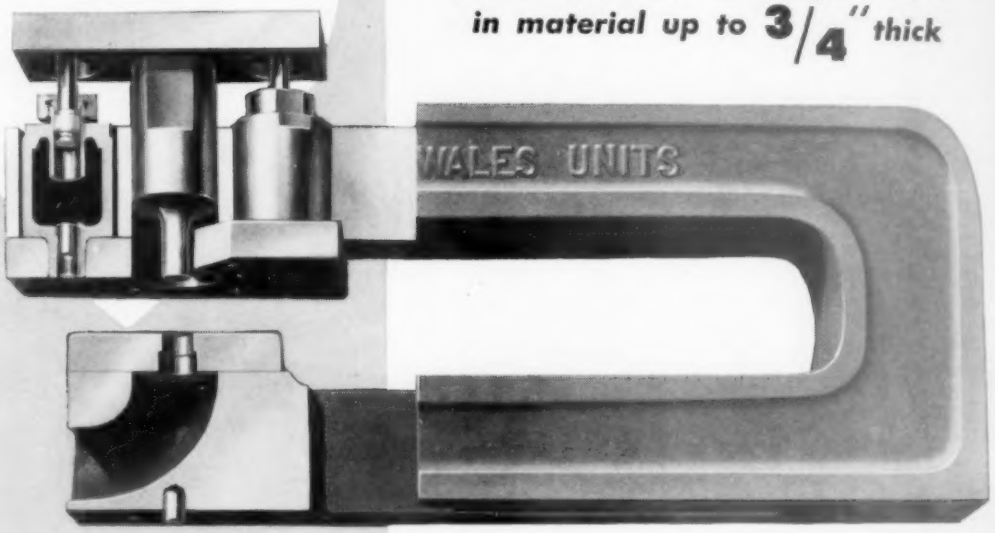
- ★ COLD-ROLL-FORMING and auxiliary machinery
- ★ GANG SLITTING LINES for Coils and Sheets
- ★ PIPE and TUBE MILLS–cold forming and welding

ENGINEERING YODER MANUFACTURING

Announcing

WALES
HYDRA-SPRING UNITS
for
punching round or shaped holes in material up to 3/4" thick

Heart of Wales Hydra-Spring Hole Punching Unit



Above cutaway view of Wales Hydra-Spring Hole Punching Unit shows two Wales Hydra-Springs (one on each side of the punch). The Hydra-Spring at left of the punch is a cross-section view.

A major *PROBLEM* in perforating sheet metal has been the stripping of thick material... not the punching. Wales Hydra-Springs *solve* this age old problem by providing many times more stripping pressure than mechanical springs of the same volume.

These *revolutionary* springs permit compact, self-contained, independent Wales Hole Punching Units to punch and *strip* material up to ½" thick.

Such *outstanding performance* is the result of utilizing the compressibility of special fluids. Wales Hydra-Spring loads may be changed by a simple adjustment to increase or decrease the volume of fluid.

This is too big a story to tell in this space so WRITE TODAY for complete information on Wales Hydra-Spring Hole Punching Units.

WALES-STRIPPIT CORPORATION

George F. Wales, *Chairman*

393 Payne Avenue, North Tonawanda, N. Y.

(Between Buffalo and Niagara Falls)

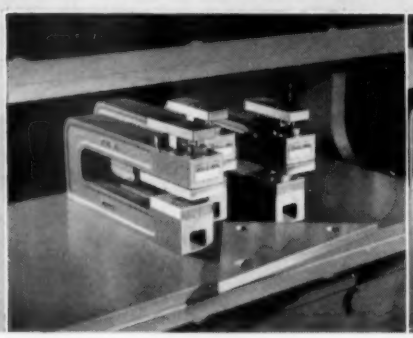
Wales-Strippit of Canada Ltd., Hamilton, Ontario

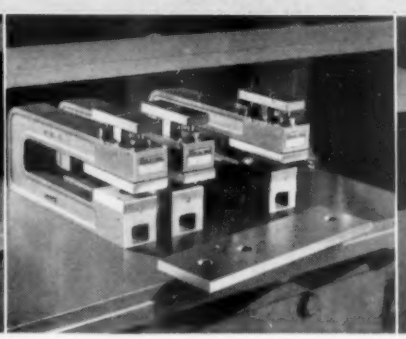
Specialists in Punching and Notching Equipment

Showing a template setup of Wales Hydra-Spring Hole Punching Units in a press brake. Note the ¼" thick work in the foreground.

A straight line setup of the same group of Wales Hydra-Spring Units as shown at left with ¼" thick punched work in foreground. The only limitation of the number of holes punched in each operation is the capacity of the stamping press or press brake.

Showing the same setup of Wales Hydra-Spring Hole Punching Units as shown at left with work on top of dies ready to be punched. Note nothing is attached to press ram.





interchangeable punches

. . . made it possible for one die to do the work of three in stamping this switch bracket for use in a 2, 3 or 4 position rotary slide switch. But the interchangeable punches made extra precise die work and accurate closure a must. That's why . . .

they built the die in a

DANLY PRECISION DIE SET

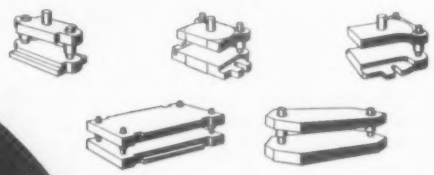
DANLY®

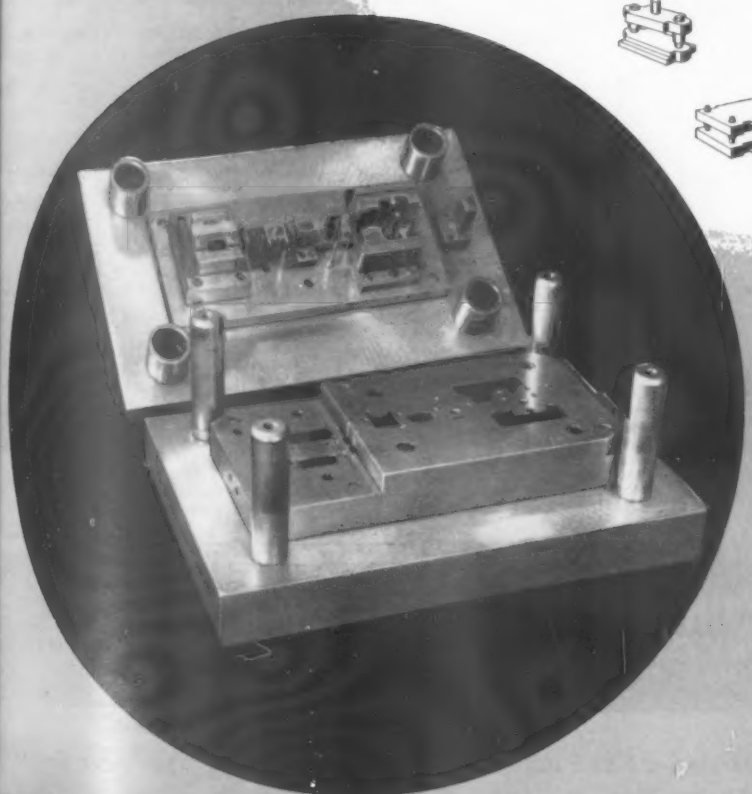
Reliable Danly precision makes every Danly Die Set the finest base for exacting die work. Square and true, they save time in the die shop and assure longer production runs in the press.

That's why diemakers everywhere prefer Danly Die Sets. They're quickly available from a nation-wide system of stocked assembly branches†... just phone for fast delivery.

DANLY MACHINE SPECIALTIES, INC.
2100 South Laramie Avenue Chicago 50, Illinois

PRECISION DIE SETS . . . STANDARD AND SPECIAL





†WHICH DANLY BRANCH IS CLOSEST TO YOU!

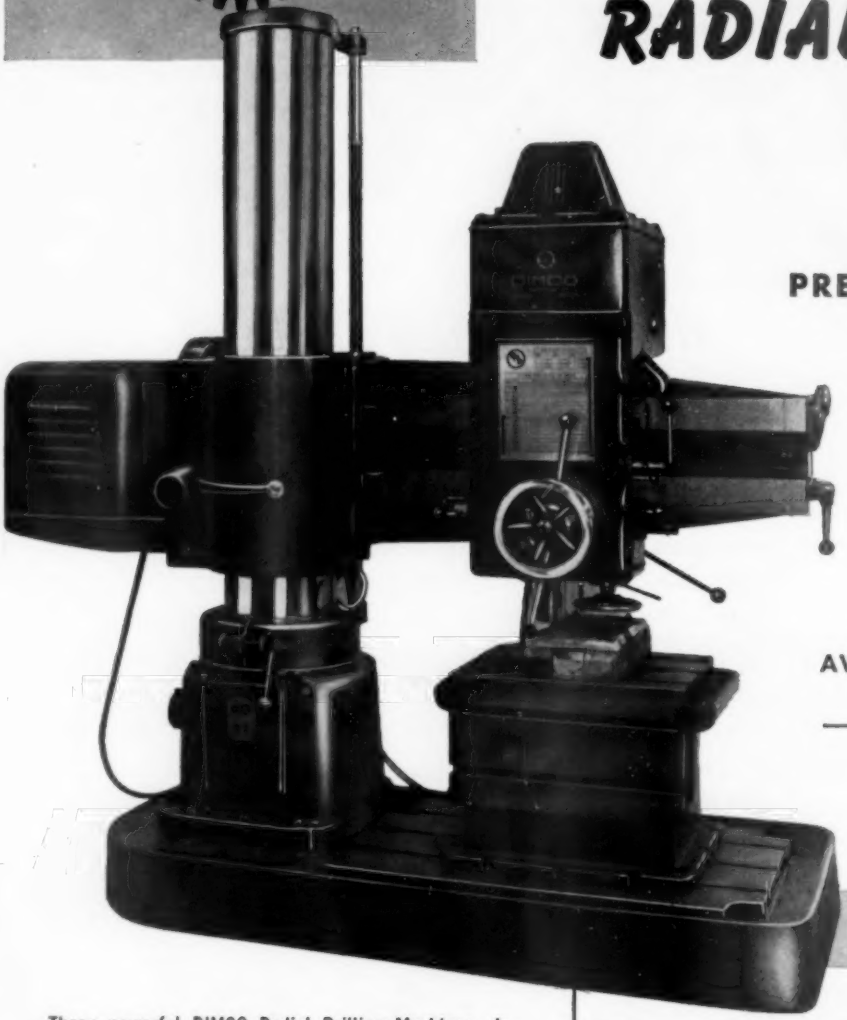
***CHICAGO** 50, 2100 South Laramie Avenue
***CLEVELAND** 14, 1550 East 33rd Street
***DAYTON** 7, 3196 Delphos Avenue
***DETROIT** 16, 1549 Temple Avenue
***GRAND RAPIDS**, 113 Michigan Street N.W.
INDIANAPOLIS 4, 5 West 10th Street
***LONG ISLAND CITY** 1, 47-28 37th Street
***LOS ANGELES** 54, Ducommun Metals & Supply Co., 4890 South Alameda
MILWAUKEE 2, 111 East Wisconsin Avenue
***PHILADELPHIA** 40, 511 W. Courtland St.
***ROCHESTER** 4, 16 Commercial St.

**Indicates complete stock*

DIMCO

HEAVY DUTY RADIAL DRILLING MACHINES

PRECISION BUILT FOR PRECISION PERFORMANCE



IMMEDIATE DELIVERY . . . NO PRIORITY REQUIRED

AVAILABLE IN TWO MODELS

No. TR-1 ..... 4 FT.

No. TR-2 ..... 5 FT.

These powerful DIMCO Radial Drilling Machines, designed and constructed for heavy production, are sturdy and rigid, giving production economy and top performance. Rigidity of the arm is the result of a system of wide ribs designed to avoid any variation, even when the saddle is in extreme outside position.

Spindle of the DIMCO is of high tensile special steel, ground all over. All gears, made from high tensile alloy steel, are hardened and ground on tooth profile with MAAG gear grinding machines. Gears and shafts are accurately balanced. They are cut with extreme precision from solid stock on Fellows machines.

The operator is always in full control of the DIMCO Radial Drilling Machine because of the built-in double friction-clutch. Column of the dual type, one internal and one external, of large diameter. Coolant system with electric pump and piping is built in. There is automatic lubrication of all saddle gears.

SPECIFICATIONS

	MODEL TR #1	MODEL TR #2
Drilling capacity in cast iron	2⅝"	2⅝"
Drilling capacity in steel	2"	2"
Tapping capacity in cast iron	2½"	2½"
Tapping capacity in steel	2"	2"
Boring capacity in cast iron	5⅛"	5⅛"
Boring capacity in steel	4¼"	4¼"
Maximum drilling radius	45⅝"	65⅛"
Minimum drilling radius	17"	18⅛"
Max. dist. from column to spindle axis	39⅜"	59"
Min. dist. from column to spindle axis	10⅝"	10⅝"
Max. dist. from spindle nose to baseplate	55⅞"	63¾"
Min. dist. from spindle nose to baseplate	8⅜"	10⅝"
Vertical range of arm on column	33½"	39⅜"
Vertical travel of spindle	13¾"	13¾"
Outside diameter of column	12⅜"	15"
Min. and Max. diameters of spindle	1.417"—1.653"	1.417"—1.653"
Morse taper	#5	#5
Overall dimensions of baseplate	76⅜" x 36⅛"	100" x 42"
Working surface of baseplate	47¼" x 35¼"	67" x 41⅜"
Working surface of table	19⅝" x 23⅝"	29½" x 29½"
Overall height of machine	89¾"	122"
Spindle speeds	12	12
Range of spindle speeds in RPM	48—1200	48—1200
Number of feeds	6	6
Range of feeds per spindle rev.	.0033"—0.02"	.0033"—0.92"
Power required	8 H.P.	8 H.P.
Approximate net weight	7260 lbs.	9680 lbs.
Approximate gross weight crated	8300 lbs.	10,900 lbs.

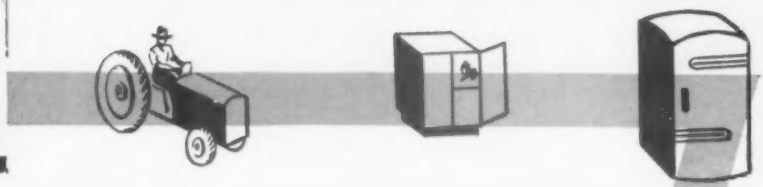
Write us for complete information!

KELVIN SYSTEMS CORPORATION
IMPORTERS OF MACHINE TOOLS

K KELVIN

SHOWROOMS | 53 WATER STREET SOUTH NORWALK, CONN.
MAIN OFFICE: 135 FRONT ST., NEW YORK 5, N.Y.

Complete Your Design Program ON TIME...



... by using

S-J SCULLY-JONES

TOOL ENGINEERING AND DESIGN SERVICE

Take advantage of 40 years' experience:

For over 40 years Scully-Jones has been designing standard and special production tools. S-J Engineers have completed design programs for plants in the automotive, aircraft, instrument, home appliance, ordnance, farm machinery, machine tool, electrical and special machinery industries. This varied experience, accumulated through the years, qualifies our engineers to help you.

Save time and money with today's performance:

S-J Engineers know the latest machining and planning practices. Our first objective when designing your dies, fixtures, gages, jigs and cutting tools is to apply the design techniques which will help you get the low-cost, fast, accurate production desired. Evidence of our ability to perform is the development, introduction and acceptance of new cost cutting standard tools such as the S-J "Quick-Lock" Adjustable Adapter, Drill Stop, "JA" and "JT" Floating Holders, Pre-Setting Gages, "Roll-Lock" Mandrels, Arbors, and Chucks.

Use foresightedness for tomorrow:

Eliminate the problem of creating or expanding your own engineering facilities. S-J Engineers work either in your plant or ours. Let some of our 70 Engineers help you complete your design and tooling program on time so you can get your new production going and keep it going.

Write or wire for further information

Scully-Jones AND COMPANY

1915 S. ROCKWELL ST., CHICAGO 8, ILLINOIS

HEADS AND HANDS TO HELP YOU SAVE TIME AND MONEY

MODERN PRECISION TOOLS

MODERN COLLAPSIBLE TAPS

Modern Self-Opening Die Heads are available in both stationary and rotary types. The stationary type is made in a range of sizes with capacity for cutting straight threads from ⅛″ to 7″, and ⅛″ to 6″ for pipe threads.

MODERN SELF-OPENING DIE HEADS

Of unusually simple design with a minimum number of parts and no complicated mechanisms, this new Modern Collapsible Tap Style A-A helps meet industry's demand for faster, lower cost production. It is made in a wide range of sizes with adequate capacities for cutting straight threads and straight and taper pipe threads. All parts are of properly hardened steel, ground and precision fitted.

Modern-Magic Quick Change Chuck and Collet Equipment virtually eliminates costly idle time usually present in revolving spindle operations. Tools are changed without stopping or even slowing the spindles. Modern-Magic Chucks are made in 6 sizes and two types: friction drive and positive drive. Modern-Magic Collets are available in a broad range of both standard and special types.

Modern Self-Opening Stud Setters are positive and entirely automatic in action, and can be operated in any position with either air or electrically driven portable tools. Also equally effective in drill presses where it is possible to drill and tap the holes and set the studs in successive operations. Made in two sizes ½″ and ⅞″ capacity.

Modern Medium Duty Face Milling Cutters are of blade backed design, and are made in axial and radial types. Standard Modern axial type cutters are available in diameters from 4″ to 24″. Standard radial type cutters from 8″ to 24″ diameters. All blades, wedges and screws are interchangeable in all Modern Cutters regardless of diameters.

MODERN-MAGIC CHUCKS AND COLLET EQUIPMENT

Detailed information covering any Modern Precision Tool in which you are interested will be furnished promptly upon request. Let us show you how Modern Precision Tools can help to speed up your production and reduce your costs.

Modern Precision Tools Include . . . . .

- STATIONARY SELF-OPENING DIE HEADS
- ROTARY SELF-OPENING DIE HEADS
- STATIONARY COLLAPSIBLE TAPS
- ROTARY COLLAPSIBLE TAPS
- MODERN-MAGIC CHUCKS AND COLLETS
- SELF-OPENING STUD SETTERS
- INSERTED BLADE FACE MILLING CUTTERS
- SOLID ADJUSTABLE DIE HEADS
- ADJUSTABLE HOLLOW MILLING TOOLS
- UNIVERSAL CHASER GRINDING FIXTURES

MODERN SELF-OPENING STUD SETTERS

MODERN FACE MILLING CUTTERS

Modern Precision Tools are produced by the originators of Modern-Magic Quick Change Chuck and Collet Equipment

MODERN TOOL WORKS

DIVISION

CONSOLIDATED MACHINE TOOL CORPORATION

SUBSIDIARY OF FARREL-BIRMINGHAM COMPANY, INCORPORATED

ROCHESTER, NEW YORK

ou can do it . . .

Firth Sterling

with . . . STANDARDS

ANDARDS

Better

Faster

Cheaper

rite for these uick reference ards today

R-192 —Standard Tips and Blanks

SA-1015—Standard Brazed and Mechanically Held Tools

R-194 —Standard Wire, Bar and Tube Drawing Dies

SA-1012—Standard Mining Tools

SA-1021—Standard Diecarb Perforators and Bushings

For information on the adaptation of Firth Sterling Standards to special applications, use the *New* FIRTHITE HANDBOOK—a complete tooling reference.

Firth Sterling

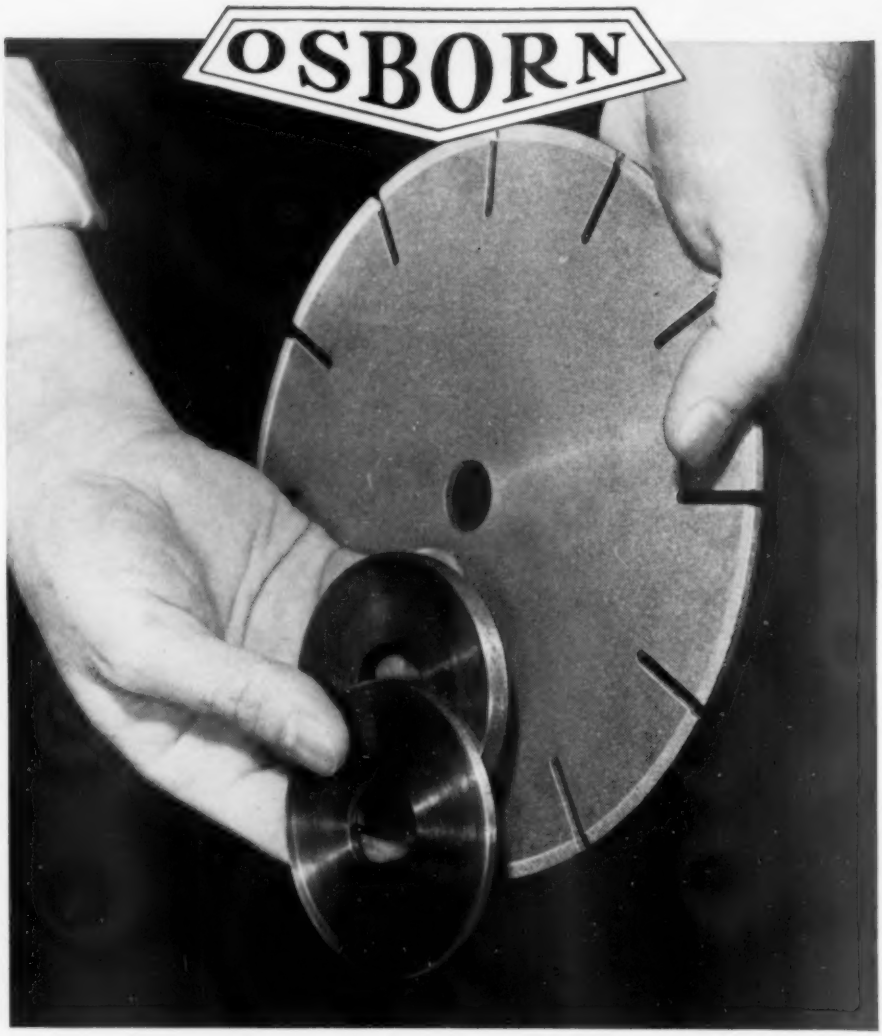
STEEL & CARBIDE CORPORATION

GENERAL OFFICES:

3113 FORBES STREET • PITTSBURGH 30, PENNA.

OFFICES* and WAREHOUSES:

Hartford New York* Philadelphia* Pittsburgh* Birmingham* Dayton* Cleveland Detroit Chicago Los Angeles



TRUE THE SURFACE. With this set-up true two diamond wheels at a time. Surfaces become uniform and perfectly flat. Usually takes about 15 to 30 minutes.

BRUSH THE MATRIX. Rotate the two wheels counter to rotation of Osborn wire wheel brush. This dressing removes some of the brass matrix. Leaves the diamonds exposed.

SEE THE DIFFERENCE. Two wheels on left show grooves before truing. Surface is arched. Two wheels on right have been trued and dressed. Dressing increased cutting action 80%.

Diamond-saving idea makes them do 80% more work!

Longer life and faster production from critcally scarce industrial diamonds are being obtained by this method of dressing diamond wheels:

When wheels become grooved and out of square, true them by grinding, two at a time. After truing, mount wheels together in grinder and dress with counter-rotating 8-inch Osborn wire brush. This brushing removes some brass matrix, exposing the diamonds. One plant reports that this increases the wheel's cutting action 80%.

This is typical of many production aids available through your **O**sborn **B**rushing **A**nalyst. Call him today or write *The Osborn Manufacturing Company, Dept. 681, 5401 Hamilton Avenue, Cleveland 14, Ohio.*

Osborn Brushes

OSBORN POWER, MAINTENANCE AND PAINT BRUSHES AND FOUNDRY MOLDING MACHINES

Why accept this?... when you actually want this?...

CARMET blanks are preformed to your order!

ATTENTION INDUSTRIAL DISTRIBUTORS:

Ask us about handling CARMET standard tools and blanks in your area. Some territories are open. Write, phone, or wire.

ADDRESS DEPT. TE-28

Above are shown two carbide metal rolls of identical composition. The one at the left cost the user about nine times as much as the one at the right. That differential was due solely to grinding vs. non-grinding. The plain face needed serrating, whereas the ready-toothed face needed nothing.

In many uses where tolerances are not too critical, CARMET blanks *preformed* to your specifications are ready for service without additional costly grinding. On jobs where finish grinding is necessary, the quality of Carmet's preforming holds grinding stock to a minimum.

Hundreds of special shapes can be preformed in Carmet. For practical suggestions that fit your needs, call or write your nearest A-L representative. ● *Allegheny Ludlum Steel Corporation, Carmet Division, Wanda & Jarvis Avenues, Detroit 20, Michigan.*

For complete **MODERN** Tooling, call

Allegheny Ludlum

W&D 4048

AL FINE TOOL STEELS SINCE 1854

WHO'S WHO

IN AIR AND HYDRAULICS

RIVETT DISTRIBUTORS are foremost authorities in applying air and hydraulic power. No group of distributors possesses more knowledge and experience about air and hydraulic power than these Rivett dealers. Most of the men in these organizations have spent their business lives working with air and hydraulics — designing circuits, recommending the correct types of valves and cylinders; and many have had a very practical background in the actual design and manufacture of most all components now being marketed.

And because Rivett furnishes a complete power package—all types of air and hydraulic valves, cylinders and power units,—these men can offer you a single source for all your power needs. They can plan a more efficient installation with units that have been designed to operate smoothly with each other. And knowing your complete design problem, Rivett distributors can furnish better help on maintenance, delivery and price.

Newark and New York—Compressed Air Products, 1977 Springfield Ave., Maplewood, N. J.; 257 Greenwich St., New York City 7, New York

Philadelphia, Pa.—The Battersby Co., 3701 N. Broad Street

Boston, Mass.—L. W. Sheehy, 1104 Park Square Building

Baltimore, Md.—Colliflower, Incorporated, 5600-10 Old Frederic Road.

Pittsburgh, Pa.—F. R. Magill Co., 44 McKnight Street

Cleveland, Ohio—Garco Machy. Co., 21000 St. Clair Ave.

Dayton, Ohio—Seifreat-Elstad Machy. Co., P. O. Box 332

Cincinnati, Ohio—Seifreat-Elstad Machy. Co., P.O. Box 2508

Columbus, Ohio—Seifreat-Elstad Machy. Co., P. O. Box 922

Detroit, Mich.—Fors Sales Co., 2832 East Grand Blvd.

Flint, Mich.—Shively Bros., Inc., 719 East 2nd Avenue

Chicago and Milwaukee—MacMillin Engineering Corp., 1737 Howard St., Chicago 26, Illinois

St. Louis, Mo.—William Scheer Co., 6376 Clayton Road

Tulsa, Okla.—The Metallurgical Supply Co., P.O. Box 1652

Columbus, Ga.—Bunn H. Martin, P.O. Box 350

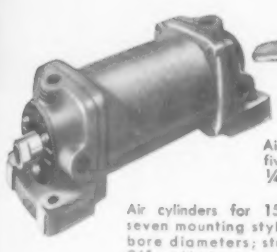
Minneapolis and St. Paul, Minn.—Anderson Machine Tool Co., 2641 University Ave., St. Paul 4, Minnesota

Los Angeles, Calif.—Machinery Sales Company, 2838 Leonis Boulevard.

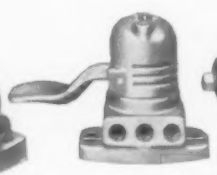
San Francisco, Calif.—Ditzen Engineering and Sales, 5271 Claremont Ave., Oakland 9, Calif.

Oregon and Washington—Hydraulic Power Equipment Co., 2316 N.W. Savier Street, Portland, Ore.

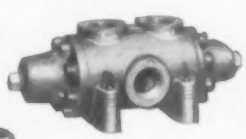
Canada—D.M. Duncan Machinery Co., Ltd., 1958 Wyandotte St. East, Windsor, Ontario; 371 Bay St., Toronto



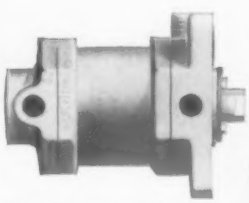
Air cylinders for 150 P.S.I.; seven mounting styles; nine bore diameters; strokes to 96"; cushioning.



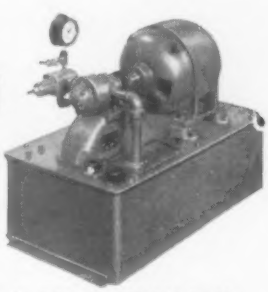
Air valves for 150 P.S.I.; five kinds of operation; ¼" to 1" sizes.



Hydraulic valves for 1500 P.S.I., up to 3000 P.S.I.; 4 types of action; 5 piston designs; 6 operations; ¼" to 1½".



Hydraulic cylinders for 300, 1500 and 3000 P.S.I.; 7 mountings; 10 diameters; strokes to 96"; standard and 2:1 rod; cushioning.



Power units .4 G.P.M. to 40 G.P.M. at 1000 P.S.I. Double units 3 G.P.M. and .4 G.P.M. to 40 G.P.M. and 12 G.P.M. at 1000 P.S.I.

RIVETT LATHE & GRINDER, Inc.

Dept. TE-4, Brighton 35, Boston, Mass.

Rivett Furnishes a Complete Power Package — Valves, Cylinders, Power Units Air and Hydraulic. All sizes and types.

For positive, vibration-resistant SELF-LOCKING UNBRAKO SOCKET SET SCREWS

UNBRAKO Self-Locking Socket Set Screws won't work loose. Non-slip internal wrenching provides positive drive. Self-locking feature prevents creep and subsequent loosening. Machinery stoppage and production losses are materially reduced. Write for descriptive literature. STANDARD PRESSED STEEL Co., Jenkintown 37, Pennsylvania.

Standard UNBRAKO *Self-Locking Set Screws, #4 to 1" inclusive, are available from your* UNBRAKO *distributor's stocks. Ask him for your supply of these and other* UNBRAKO *threaded industrial fasteners.*

sps JENKINTOWN, PENNSYLVANIA

UNBRAKO® SOCKET SCREW DIVISION

CAP SCREWS • SET SCREWS • SHOULDER SCREWS • DOWEL PINS • PRESSURE PLUGS

tool steel is our pride and joy!

Think of tool steel — think of Crucible! That's the reputation we've had for over half a century with our tool steel users. We've never stopped working to maintain our leadership . . . leadership that has kept us the country's *number one* tool steel producer.

Crucible research and development continues to match Industry's need for new and improved tool steels. You can profit from the experience gained by Crucible in the application of tool steels to thousands of uses. Our metallurgical service is freely available to you . . . and our conveniently located warehouses maintain a full supply of tool steels for prompt delivery.

SEND TODAY for the unique Crucible Tool Steel Selector — a twist of the dial gives the tool steel for your application.

Rex® High Speed Steels
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SPECIFY YOUR TOOL STEELS BY THESE BRAND NAMES

Crucible Steel Company of America
Dept. T, Chrysler Building, New York 17, N. Y.
Name_____
Company_____ Title_____
Address_____ City_____ State_____

9" diameter, 3-colors

CRUCIBLE first name in special purpose steels

52 years of *Fine* steelmaking

TOOL STEELS

CRUCIBLE STEEL COMPANY OF AMERICA · TOOL STEEL SALES · SYRACUSE, N. Y.

PARKER • MAJESTIC PM PRECISION MACHINES

Above is pictured the home and products of the

PARKER-MAJESTIC, INC.

For over twenty-one years this company has manufactured the Parker Spindles used in Precision Grinding, Boring and Milling applications.

Supplementary products include the well known line of Parker-Majestic Internal, External, No. 2 Surface and Rotary Surface Grinders.

Descriptive literature upon request.

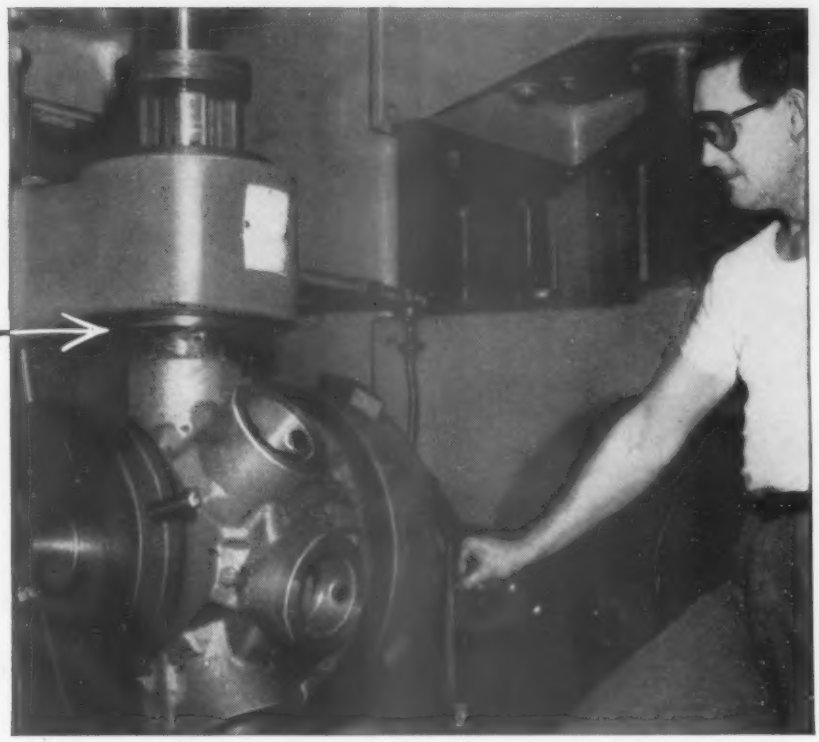
PARKER-MAJESTIC, INC.

formerly **MAJESTIC TOOL & MFG. CO.**

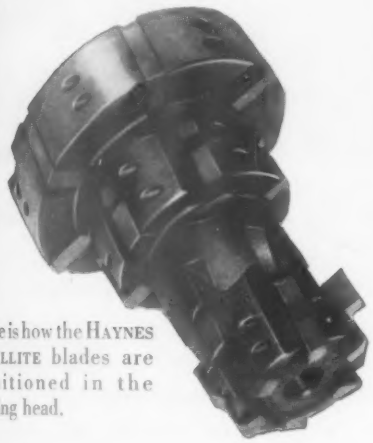
147 JOS. CAMPAU • DETROIT 7, MICHIGAN

2000 Cylinder Ports per Grind

because HAYNES STELLITE *tools resist* CHIPPING and SPALLING



This boring head, containing 20 HAYNES STELLITE inserted blades, operates for 4 to 6 weeks without grinding.



Here is how the HAYNES STELLITE blades are positioned in the boring head.

A multiple blade boring head containing 20 HAYNES STELLITE alloy inserted blades operates from 4 to 6 weeks without regrinding at a plant making refrigeration and air-conditioning equipment. The tools bore, chamfer, counterbore, drill, and face the cylinder ports in cast iron compressor heads. This is all done in one operation.

HAYNES STELLITE blades average over 2000 cylinders per grind even though machining is complicated by an intermittent cut at a gas outlet port in the cylinder wall. The tools are good for 25 regrinds—an average of 50,000 cylinders per cutter.

Tools made of HAYNES STELLITE alloy resist chipping and spalling—even on tough jobs like this one. This is one reason why the tools are easy to grind and can be reground so many times.

For information on how to use HAYNES STELLITE tools on your machining jobs, write for the booklet "HAYNES STELLITE Metal-Cutting Tools." It gives helpful information on chip formation, tool design and the machinability of metals.

HAYNES TRADE-MARK *alloys*

Haynes Stellite Company
A Division of
Union Carbide and Carbon Corporation
UCC
General Offices and Works, Kokomo, Indiana
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Chicago — Cleveland — Detroit — Houston
Los Angeles — New York — San Francisco — Tulsa

"Haynes" and "Haynes Stellite" are trade-marks of Union Carbide and Carbon Corporation.

Simple, compact design combines light weight with strength, to function dependably and accurately at high indexing speeds, with long runs between grinds.

All important bearing surfaces are hardened and ground and hand lapped.

All external surfaces are chrome plated for protection.

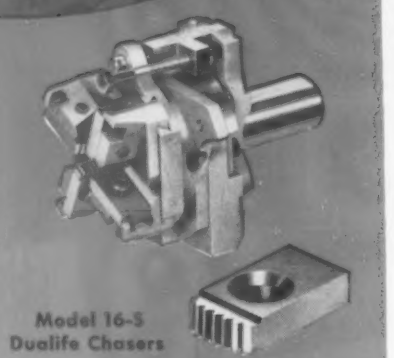
JONES & LAMSON AUTOMATIC OPENING DIE HEADS

for Brown & Sharpe Automatics and Small Turret Lathe Applications

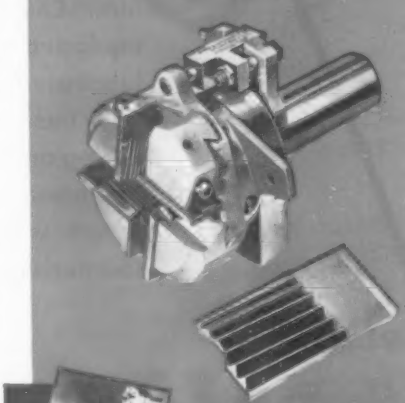
Designed and built for high production quality threading, these new J&L dies perform with smooth, easy action, unusual repetitive accuracy, and year 'round dependability at low cost. They will give you maximum productive machine hours each day.

No. 16-S is for use on No. 00 and 00G and No. 0 and 0G Brown & Sharpe Automatics and small turret lathes. It uses long wearing ground thread, radial type chasers *with two cutting* edges. These DUALIFE chasers are easily and quickly removed and replaced in their holders. When one edge wears out, just turn them over, and you have the equivalent of a new set of chasers. Minimum down time and maximum production result.

No. 18-S and 19-S Model 18-S is for use on No. 0, 0G and No. 2, 2G Brown & Sharpe Automatics. Model No. 19-S with wider capacity range, is for use on No. 2, 2G Brown & Sharpe machines. Both are also used on small turret lathes. They have Tangent type chasers, ground all over, incorporating the exact helix angle and thread form. They are easily removed and replaced without disturbing the head and holder assembly. Many of these chasers are interchangeable between the two models and other standard J & L Tangent Die Heads. Carbide chasers can be used when conditions permit.



Model 16-S Dualife Chasers



Models 18-S and 19-S with precision ground tangent type chasers

WRITE DEPT. 710 FOR TANGENT AND RADIAL DIE CATALOGS

JONES & LAMSON

Machine Tool Craftsmen Since 1835

JONES & LAMSON MACHINE COMPANY
Springfield, Vermont, U. S. A.

DIE HEAD DIVISION

SIMPLEX

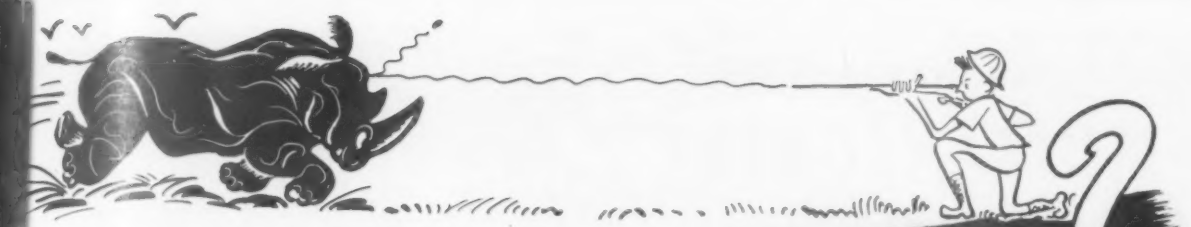
DOUBLE ACTION FOR MORE PRODUCTION

SIMPLEX 3U 2-way Hydraulic Feed Precision Boring Machine equipped with four #4 SIMPLEX self contained automatically lubricated precision boring heads, a three station hydraulically indexed trunnion and work holding fixtures for precision boring and counterboring wrist pin holes in aluminum pistons. The trunnion allows the operator to unload and reload the fixture while both wrist pin surfaces are being bored and counterbored simultaneously.

PRECISION BORING MACHINES

SIMPLEX MACHINE TOOLS DIVISION
STOKERUNIT CORPORATION
4528 West Mitchell Street
MILWAUKEE, WISCONSIN

Precision Boring Machines, Planer Type Milling Machines, Special Machine Tools



A "22" FOR A RHINO?

. . . no, No, NO — it takes something special to stop big game. BAY STATE has developed 3 special ways to "stop" your segmental grinding problems—big or small.

FRACTIONAL GRADES:
Where a whole grade change would be too great, BAY STATE splits a normal grade into 3 degrees of hardness.

KOOLPORE SPECIFICATIONS:
Where faster production is required without burning expensive tools, etc., BAY STATE manufactures segments with special induced pores.

ENGINEERING:
Where grinding problems are really tough, BAY STATE research has the answers. The answer for you may be a special grain combination — such as the popular BAY STATE "8A".

Ask for our "on-the-job" engineering service today.

BAY STATE

BAY STATE ABRASIVE PRODUCTS CO.
Westboro, Mass.

Branch Offices and Warehouses —
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Distributors — All principal Cities
In Canada: Bay State Abrasive Products Co. (Canada) Ltd.
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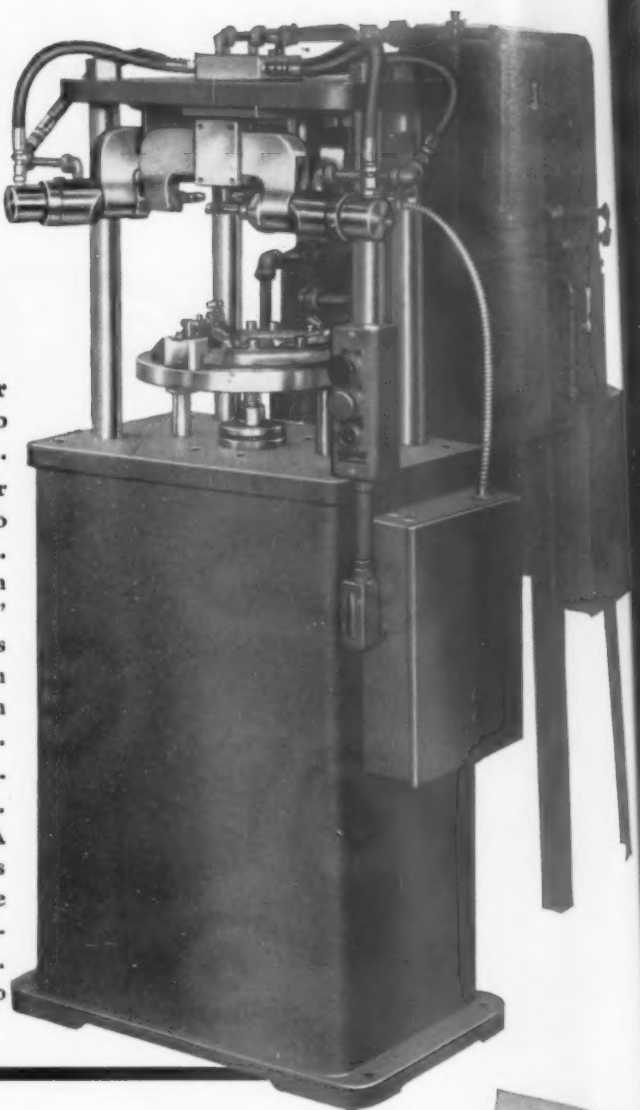
BAY STATE'S current expansion program includes a new 250 foot kiln plus a 30% increase in plant capacity . . . this means better deliveries to you.

THIS PRESS STAKES 3 PINS
SIMULTANEOUSLY
AT 3 DIFFERENT ANGLES!

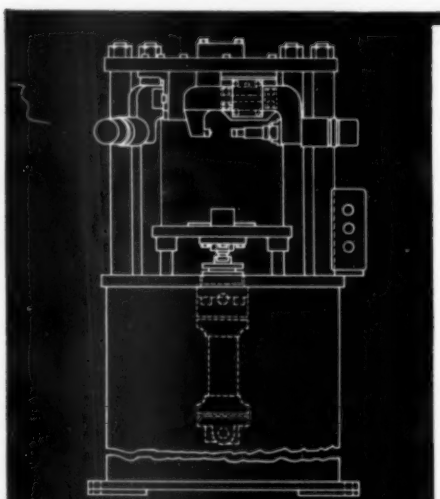


What Does This Suggest to You?

Tool engineers for a large automotive parts manufacturer utilized standard Hannifin "Hy-Power" components to build this special high-production machine (see below).

"Hy-Power" Hydraulics may be the answer to your problem, too. For here is equipment that permits you to apply forces up to 100 tons at any angle you want . . . permits you to punch, rivet, stake, crimp or bend in *two or more planes simultaneously.* Compact "Hy-Power" high pressure cylinders exert the force. The source is the Hannifin "Hy-Power" Generator . . . a combination of motor, pump, oil reservoir, control valves and high pressure intensifier assembled as a compact, single unit.

Hannifin "Hy-Power" Hydraulics has brought production economies to manufacturers in many fields. Why not explore the possibilities it holds for you? A Hannifin Field Engineer will discuss with your engineers how you can incorporate this modern equipment in the machines you build, whether they are one-of-a-kind specials or machines to be built by the hundreds, for resale. Hannifin Corporation, 1119 S. Kilbourn Ave., Chicago 24, Illinois.



THE PROBLEM:

To stake the three pivot pins, located 120° apart, which hold the actuating fingers of a clutch pressure plate.

THE "HY-POWER" SOLUTION:

Three 7½-ton "Hy-Power" cylinders were installed and positioned to stake the three pins simultaneously. Clutch plate, fingers and pins are placed in fixture. A button is pressed, a standard Hannifin cylinder raises the fixture to position, and the three pins are staked—*automatically, simultaneously.* The fixture returns to its original position automatically, for unloading and reloading.

WRITE FOR BULLETIN 150

This book belongs in your files. A copy, telling the complete story of Hannifin "Hy-Power" Hydraulics, will be sent on request.

do ALL you CAN do . . . with

HANNIFIN

Air and Hydraulic Cylinders • Hydraulic Presses • Pneumatic Presses • "Hy-Power" Hydraulics • Air Control Valves

BASIC FACTS ON GEAR TOOTH CROWNING

End Bearing

Elliptoid Tooth Form

Q. Why are gear teeth given the Elliptoid tooth form or crowned?

A. To PREVENT "end bearing" in service.

Q. What is "end bearing"?

A. A concentration of load at the end of the tooth due to end contact between teeth rather than its distribution along the entire tooth face —the condition for which the tooth was designed.

Q. Why is "end bearing" objectionable?

A. Because it imposes concentrated stresses beyond the fatigue strength of the material at the contact point which may lead to premature failure. It is also an important cause of noisy gear operation.

Q. What is gear tooth crowning?

A. A calculated elliptical reduction in tooth thickness from the point of maximum crown (usually the center) toward both ends. Normally it amounts to .0003" per inch of face width per side, but this is optional depending on service conditions.

Q. Can "end bearing" be avoided by any other method?

A. No. Because

1. It is practically impossible to assure perfect alignment under all conditions of loading due to unavoidable deflections in shafts, bearings and the mountings, all of which are elastic.

2. It is also impracticable to avoid all fire distortion in hardening gears which have been machined previously.

Q. How are gear teeth crowned?

A. On Red Ring Shaving Machines.

Q. Can the amount of crown be controlled accurately?

A. Positively. Such a large number of leading automotive gear plants would not be using it otherwise.

Crowning is controlled on the Model GCI Shaving Machine by locking the cam which actuates the table movement at the desired point. Models GCU and GCV use formed cutters ground precisely to the amount of crown required. No variation is possible without changing cutters.

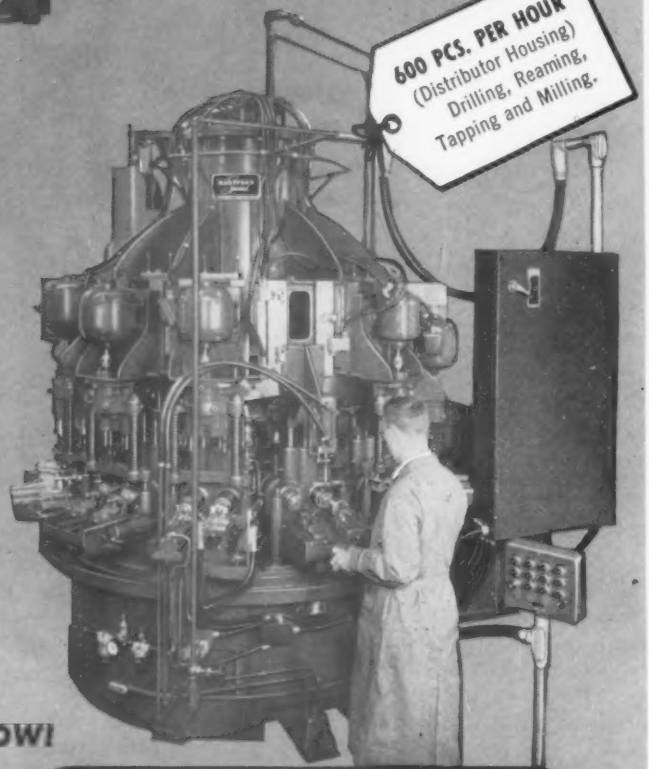
In a random check of 4000, 1" face gears the maximum variation in the amount of crown was within the specified tolerance of .0002".

Write for
BULLETIN S49-5
for a more detailed discussion of gear tooth crowning.

NATIONAL BROACH & MACHINE CO.
5600 ST. JEAN . . . . . DETROIT 13, MICHIGAN
WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT

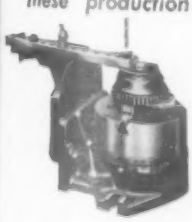
When it comes to production- come to Hartford Special

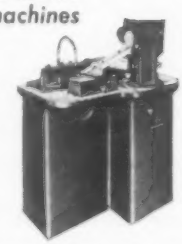
..... for AUTOMATIC DRILLING & TAPPING MACHINES

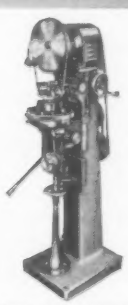


WRITE FOR BULLETIN NOW!

Hartford Special also makes these production machines


SUPER-SPACERS


Automatic THREAD ROLLERS

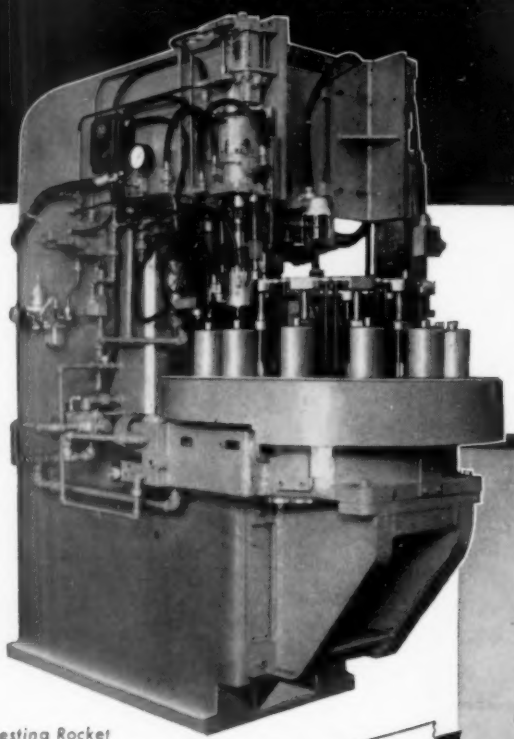

DIE POLISHERS

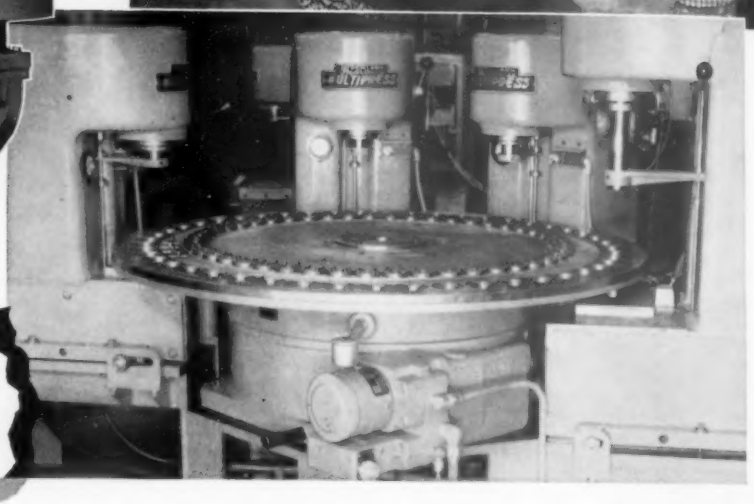
HARTFORD Special

THE HARTFORD SPECIAL MACHINERY CO.
HARTFORD 12, CONNECTICUT

DENISON INDEX TABLES

—*multiply* production speeds by faster *continuous* parts loading





Testing Rocket Bodies Hydrostatically— Automatically—

A Production Tip for Better Ordnance and Industrial Jobs

adds further versatility to the rapid action of

MULTIPRESS®

Thousands of Multipress users are daily proving—on both industrial and ordnance jobs—that automatic rotary feeding of parts is a sure way to speed up production . . . *and do it safely.* Synchronized and interlocked with the machine action, the table automatically turns, simultaneously carrying one loaded part to the work station and the preceding part on to the ejection station where it is either manually or automatically ejected.

As illustrated above, one or several operators working safely out of reach of the ram action, simply load parts or multiple-part assemblies into holding fixtures evenly spaced around the dial. No lost machine production time for loading or unloading the work in process!

Likewise, where the work requires progressive machine operations, more than one production unit can be placed at different work stations around the table.

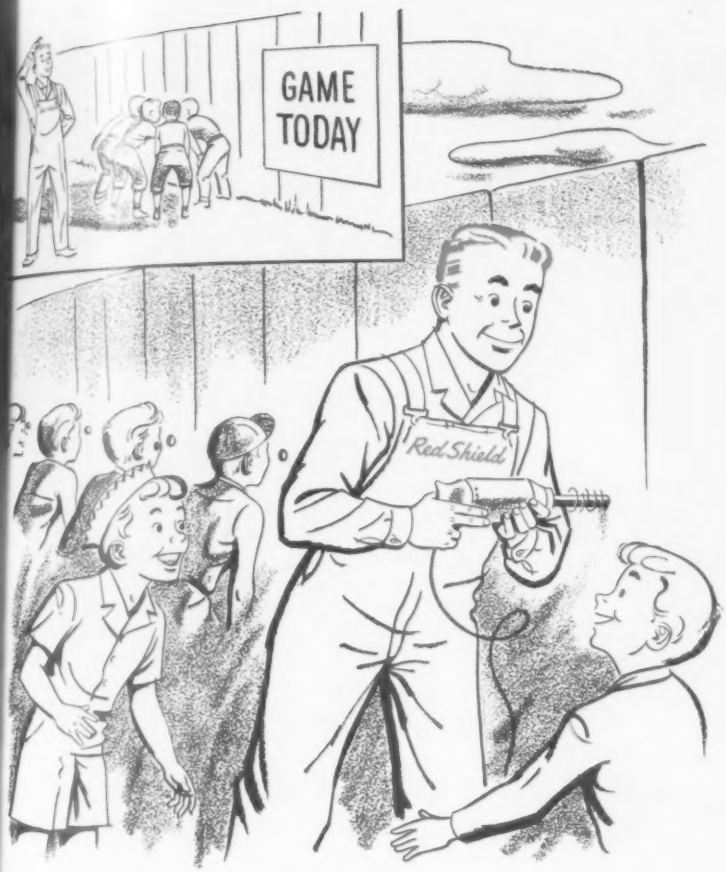
Rotated by oil hydraulic power at speeds from 10 to 70 indexes per minute and available in six or twelve station models, the Denison Index Table has wide application. But combined with Multipress—with its wide range of ram action, and 8 frame sizes in capacities from 1 to 50 tons—you have a high speed production machine adaptable to almost unlimited application. One worthy of investigating today! Write.

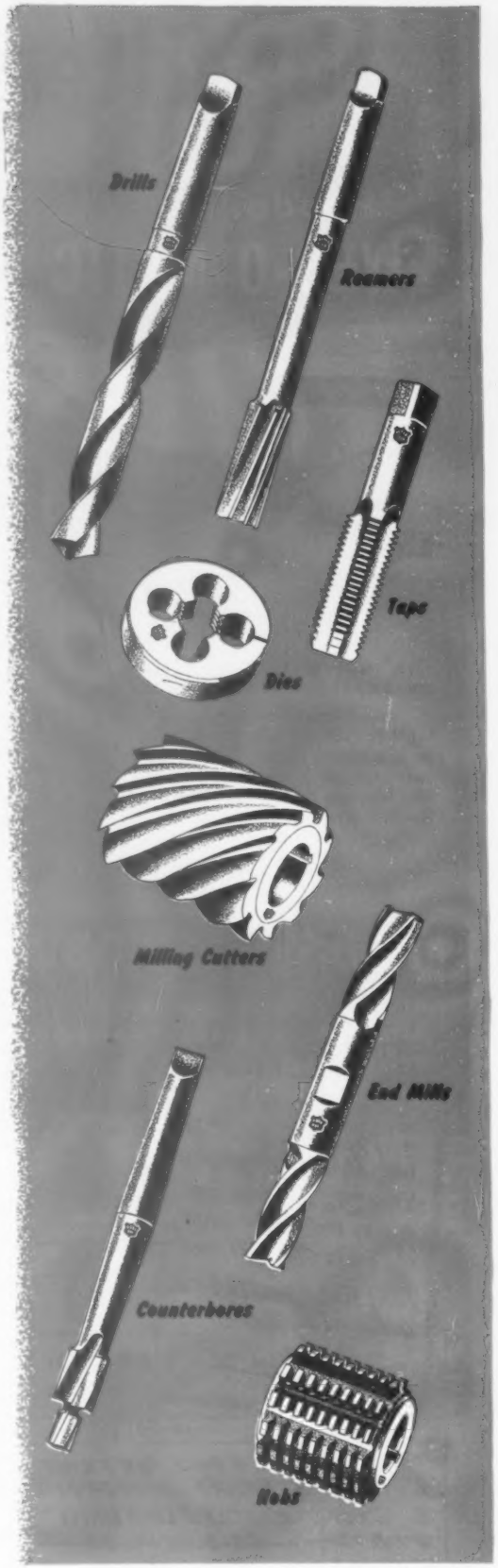
It's Also An Ideal Rotary Feed For Other Types of Equipment!

DENISON HydrOILics

TRADE MARK

The DENISON Engineering Co.
1191 Dublin Rd., Columbus 16, Ohio





Fast Production

makes everybody happy

FOREMOST quality in design, workmanship and material makes Standard Shield Brand Tools the key to fast, uninterrupted production.

Our 71 years' accumulated experience in solving tough drilling and metal cutting problems is available to you through Standard Red Shield Representatives without cost or obligation. Call or write

STANDARD TOOL CO.

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STANDARDIZE AND SAVE WITH STANDARD RED SHIELD METAL CUTTING TOOLS. STANDARD DISTRIBUTORS IN MORE THAN 500 CITIES CAN SUPPLY YOUR REQUIREMENTS.

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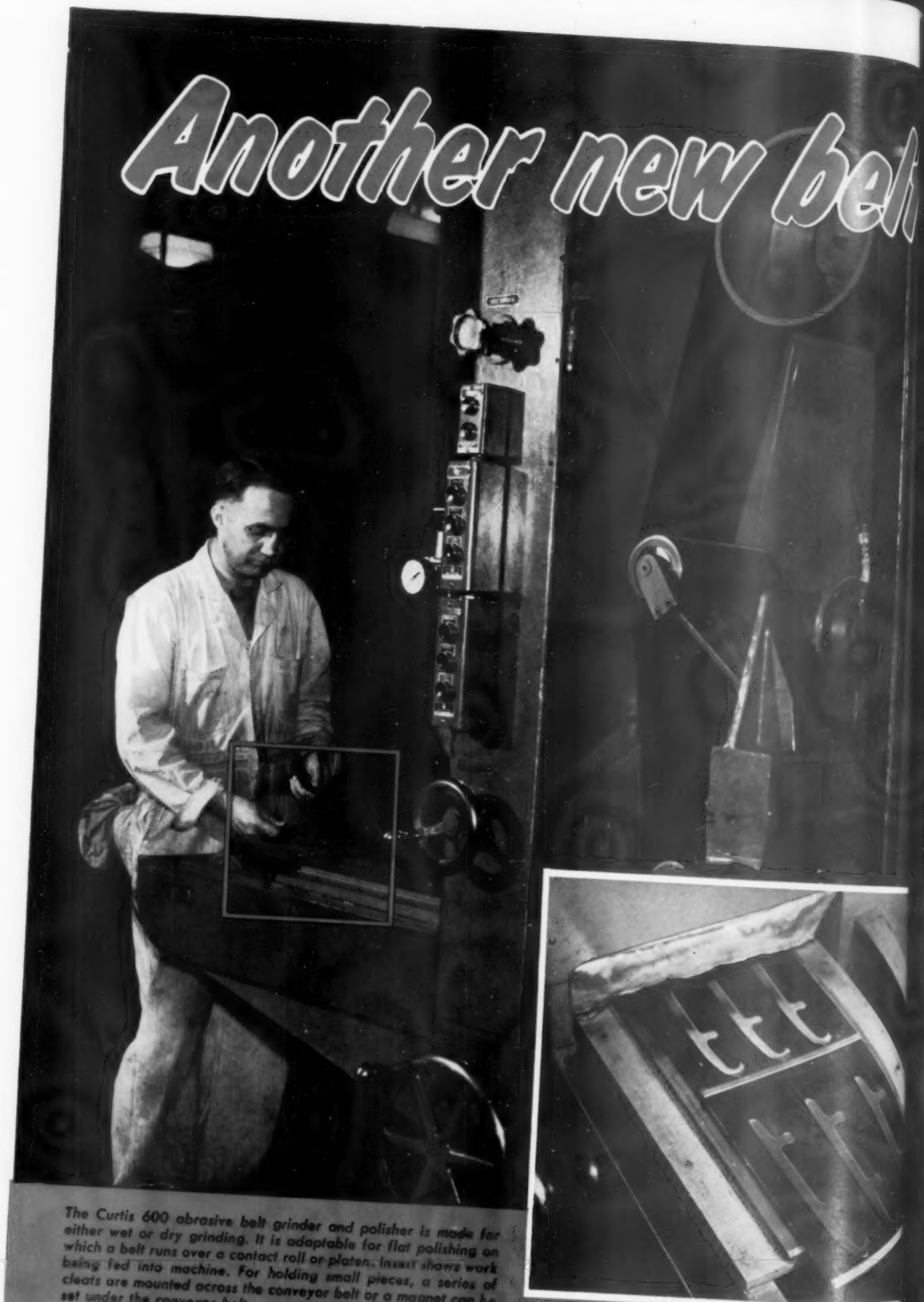

The Curtis 600 abrasive belt grinder and polisher is made for either wet or dry grinding. It is adaptable for flat polishing on which a belt runs over a contact roll or platen. Insert shows work being fed into machine. For holding small pieces, a series of cleats are mounted across the conveyor belt or a magnet can be set under the conveyor belt.

in'shing short-cut

...WITH

EHR-MANNING abrasive belts

And that's plenty fast in this Curtis conveyor nder and polisher. Light sheet metal parts zip ough at speeds up to 40 feet per minute. lf way through, they meet a fast-moving, quick- ting Behr-Manning abrasive belt. In a split cond this belt removes tool marks, leaving a iform surface easily polished by succeeding grits.

re's a machine that symbolizes the speed and st-cutting factors of mass production. It is also presentative of the many new developments belt-grinding and polishing procedures; in ny cases worked out in cooperation with hr-Manning Abrasives Engineers. Check ith your Behr-Manning representative he'll keep you up to date on the test belt-finishing short cuts.

o better belt is made for assembly- ne production speed and economy. very grain is anchored sharp-end p... by the Behr-Manning atented Electro-coating method ..and that's the way they stay! pecial DURABONDED® process ecures the grit in a double grip— keeps them in cutting position even hen the going gets hot and heavy.

NEW INFORMATION
....on coated abrasive grinding and polishing tools and methods. For your free copy, write to Behr-Manning, Troy, New York or for export, Norton Behr-Manning Overseas, Inc., U. S. A., New Rochelle, N. Y. Address Dept. TE-4

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CORPORATION
® division of NORTON Company

▲ COATED ABRASIVES
▲ SHARPENING STONES
▲ PRESSURE-SENSITIVE TAPES

Air Powered Feeding Helps Inexperienced Operators

Dunnington Manufacturing Co. uses Bellows Rotary Feed Table and Air Motor in unusual set-up — cuts costs from .005 to .001

In large or small plants, high production today requires ingenuity. Special machines aren't quickly available. Sometimes they have to be built from scratch, or developed from standard components. Bellows "Controlled-Air-Power" Devices offer a practical and economical starting point.

The basic devices: air cylinders, air motors, air-operated power drills, drill press spindle feeds, rotary work feed tables, and work holding and clamping devices, are complete power units in themselves, with built-in manual or electrical controls. They are used as components in tool-room built production equipment, or to convert manually operated machines to semi-automatic or automatic operation. Their precision controls permit even inexperienced operators to handle close tolerance work at high production rates with minimum fatigue, and few rejects.

The current Foto-Facts File showing typical applications of Bellows equipment in 20 diversified manufacturing plants, with wiring diagrams and installation details, is free on request. Write Dept. TE452, The Bellows Co., Bellows Bldg., Akron, Ohio.

The tool room unit shown above is press-fitting two hardened bushings into a spacer at 2000 complete units per hour. The upper photo shows the operator inserting parts on the 20-station Bellows Rotary Feed Table. The lower photo shows the Bellows Air Motor used to press the bushings into the spacer.

1382

The Bellows Co.

Akron 9, Ohio

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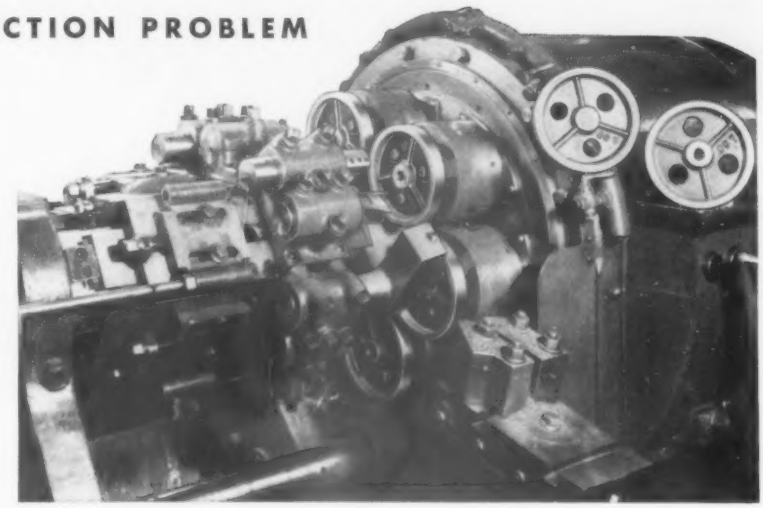
HIGH PRODUCTION TOOLING

TYPICAL OF THE EXTRA VALUES YOU GET WHEN YOU BRING A PRODUCTION PROBLEM TO BAIRD . . .

Year-in and year-out, in many automobile and other headlined production plants, Baird's No. 76-H Automatic Chucking Machine has proved itself to be one of the best production units of its kind. It's easy to operate and service; has unusual versatility in tooling, operations, speeds; and it cuts costs with quality control.

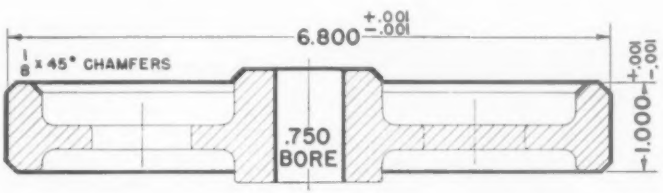
But the pay-off comes when Baird engineers adapt this 6-spindle unit to your specific tooling and production requirements.

For example, gear blanks (drawing below) are turned completely in one operation as shown. Material: High tension iron-hardness 85-90 Rockwell B scale. Production: 65 seconds each, 55 pieces per hour.



BAIRD No. 76H AUTOMATIC CHUCKING MACHINE

Of course we're busy. But not too busy to try and solve a problem for a new or old customer. Ask Baird about it!



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BULLARD MACHINE TOOLS

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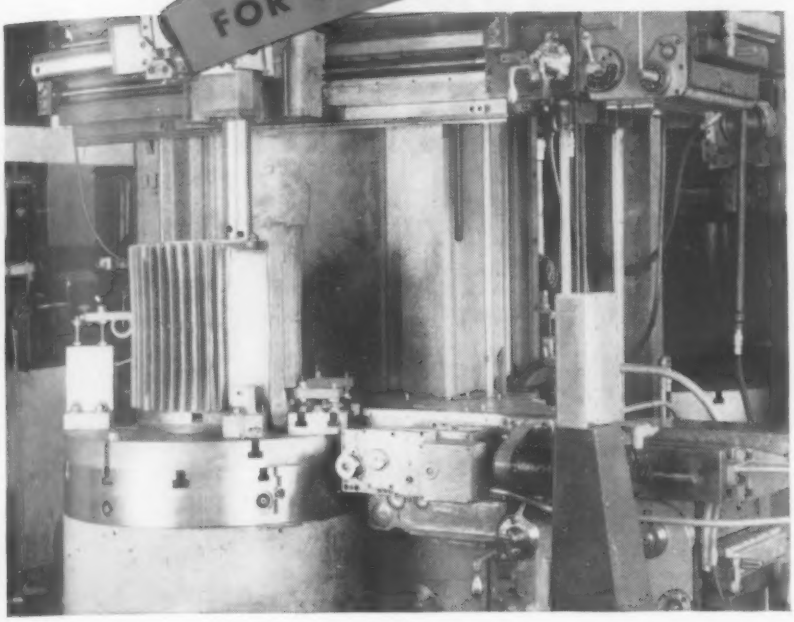


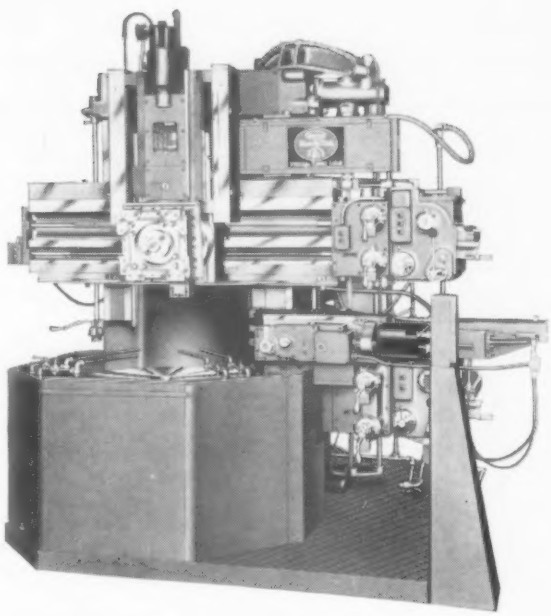
The inception of Bullard Man-Au-Trol Vertical Turret Lathes began a New Era of metal cutting in the field of single spindle turret lathes.

Man-Au-Trol principal provides both manual or automatic control of the machine and a simple method of predetermined operations easily reset for changes in work design.

Versatility and many modern features of Man-Au-Trol Vertical Turret Lathes place them at the top of the list for Greater Manufacturing Economy.

Machining an electric motor frame as illustrated above is only one of the many classes of work that Man-Au-Trol produces for the Greater Economic World in which we live.

The present urgency for delivery of electrical units needed to power all types of Industries, road building, agricultural, transportation and many, many other kinds of equipment are calling upon Bullard for delivery of Machine Tools to speed the manufacturing processes.



Learn more about Man-Au-Trol Vertical Turret Lathes built in 30-, 36-, 42-, 54-, 64-, and 74-inch sizes. Write for circular.

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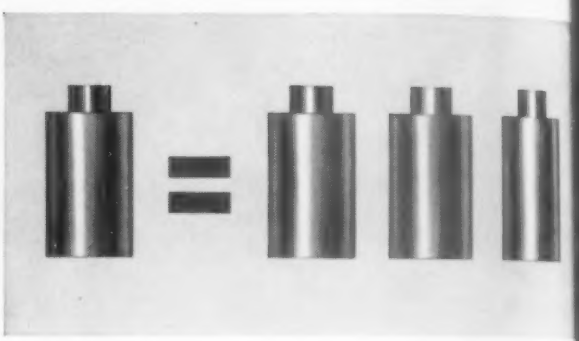
GRAPH-MO STEEL SETS NEW STANDARDS OF GAGE PERFORMANCE!

Most stable gage steel ever made—outwears others 3 to 1!



12-YEAR STABILITY TEST SHOWS ONLY 10 MILLIONTHS CHANGE IN GRAPH-MO STEEL GAGE

The introduction of Graph-Mo steel to the gage industry has opened the door to new standards of gage performance unattainable with conventional gage steels! New stability! New wearability! New machinability!

Proof of Graph-Mo's outstanding stability is the series of measurements shown below, taken on a typical Graph-Mo steel plug gage. After a period of twelve years this gage measured within ten millionths of an inch of its original dimension.

1940—1.73996	1944—1.73996
1941—1.73995	1945—1.73997
1942—1.73998	1948—1.73997
1943—1.73997	1951—1.73995

REPORTS FROM USERS SHOW GRAPH-MO STEEL OUTWEARS OTHER TOOL STEELS 3 TO 1

Graph-Mo—a Timken® graphitic tool steel—contains free graphite and diamond-hard carbides. As a result, it has minimum tendency to scuff, or gall, and stubbornly resists wear. Reports from users who have switched to Graph-Mo steel gages show that it outwears other tool steels an average of 3 to 1!

Graph-Mo machines 30% faster than other tool steels, takes a smoother finish, and *is available now!*

You can always tell Graph-Mo by its "graphitic look"—tiny, scattered, parallel marks barely visible on the surface of a piece of polished Graph-Mo. This built-in "trade mark", result of free graphite in its structure, can't be duplicated in other steels. Look for it, insist upon it, next time you buy gages.

Write The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO"

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SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS TUBING

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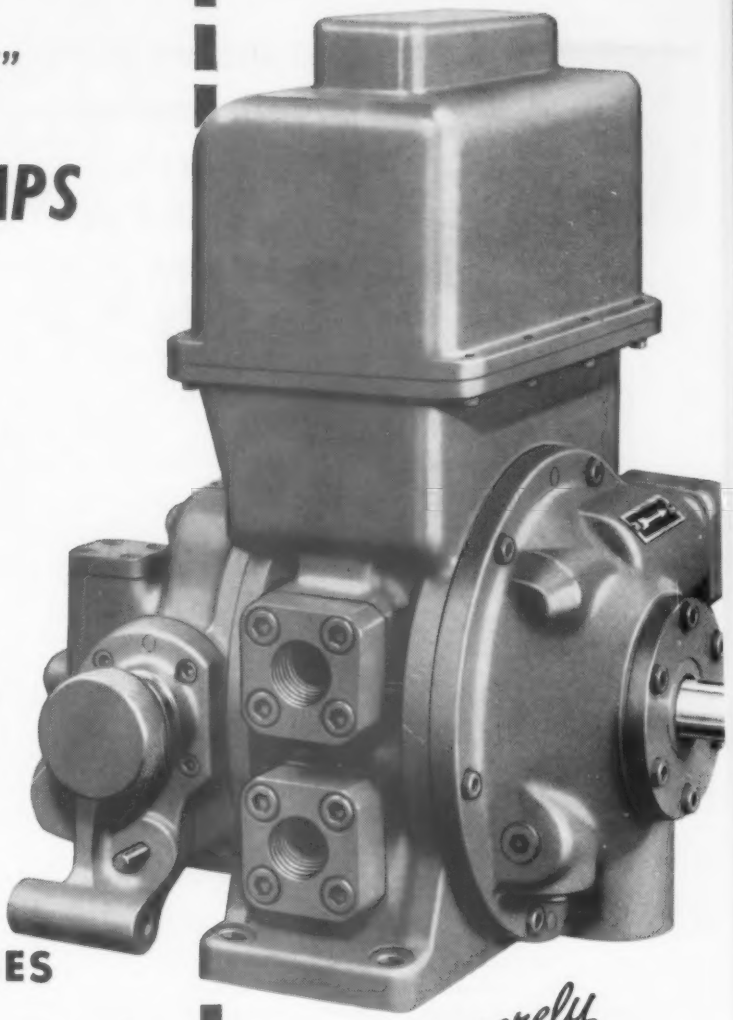
Are So Easy to Apply

TO NEW OR OLD MACHINES



connect a new, small Oilgear Feed Pump to an Oilgear cylinder n Oilgear engineered control and ave a complete pushbutton and -controlled fluid power system. ydraulic or electric application en- ng is required. Merely follow rd recommendations in mounting connect pump to cylinder with ipes and wire two solenoids on to electric controls. Oilgear sup- he feed pump, cylinder, control limit switch panel, control panel ushbutton station. Oilgear pro- patented, tried and proven hy- c and electric circuits.

can improve your new and old nes without further congesting ngineering department or employ- d to get qualified hydraulic engi- You cut production and assembly because *NO* mechanical control es . . . *NO* auxiliary valves, pipes ngs are required. You do not have to risk delay, disappointment or malfunctioning. You avoid divided responsibility. You receive the full values inherent only in 100% Oilgear systems.

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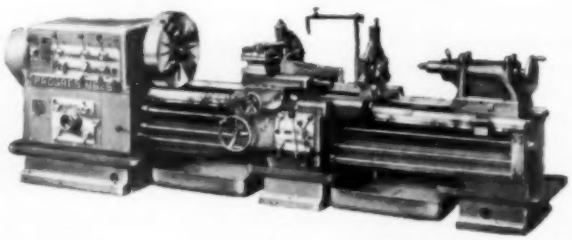
FOR TOOLROOM and PRODUCTION WORK

12 Spindle Speeds, built-in Lubricating Pump, ground and hardened Gears, Vee-Ways, Quick Change Gear Box with wide range of Turning and Threading Feeds for 40 different U.S. Standard and 40 Metric Threads, 4-way Toolpost.



TYPE	N-425	N-525	N-625	N-725
Swing over bed	16¾"	20¾"	24¾"	28½"
Minimum center distance	39"	59"	78"	78"
Maximum center distance	157"	236"	315"	315"
Spindle speeds, R.P.M.	11 to 1,000	8 to 710	8 to 710	8 to 710
Drive motor, H.P.	7½	10	15	15
Net weight, (min.c.d.)	4,350 lbs.	6,060 lbs.	11,080 lbs.	11,750 lbs.

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Illustrated Quotation will be sent upon request

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SOLID CARBIDE CUTTING HEADS

CARBO-MILLS ASK NO SPECIAL FAVORS

3/32" SHANKS

7 Standard Numbers, featuring REAL cutting teeth to remove stock faster over long periods of use—as well after regrinding as when new.

IN PORTABLE TOOLS

CARBO-MILLS by the ORIGINATOR of Ground-from-the-Solid Mills

1/8" SHANKS 12 STANDARD NUMBERS THE POPULAR WORK BENCH SET

NO PROBLEM OF TOOTH CHIPPING OR BRAZE-FAILURE

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LAST UP TO 75 TIMES LONGER THAN ROTARY FILES OF HIGH SPEED

DIE MAKERS! ASK FOR THIS SET

Furnished to you in a sturdy wooden case; Di-cor Set No. 40 is a set of 8 ¼" shank CARBIDE mills designed and constituted specifically for you, the Tool and Die Maker. Specially selected shapes. Special tooth patterns and cuts for all types of precision Tool and Die work. You will ply your skills easier and faster than ever before with these personal finishing mills. These CARBIDE mills need absolutely no coddling and will win their way to the the most favored spot on your Work Bench! Send for complete information and prices today! Ask for Leaflet No. 645

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1 super finish reduces wear to a minimum

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Standard Drill Bushing

Boring Chuck

Mikro-Lok Boring Bar

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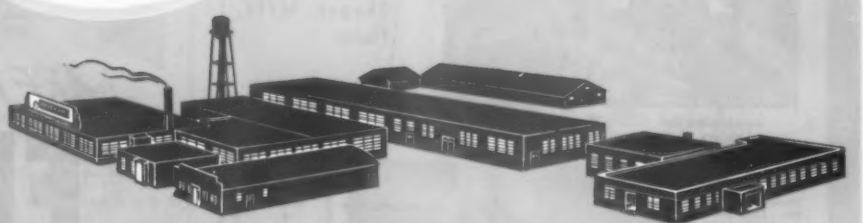

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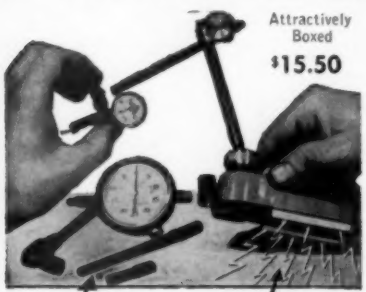

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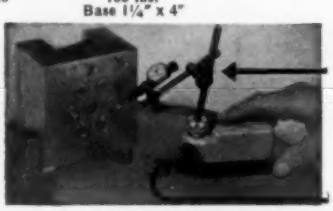

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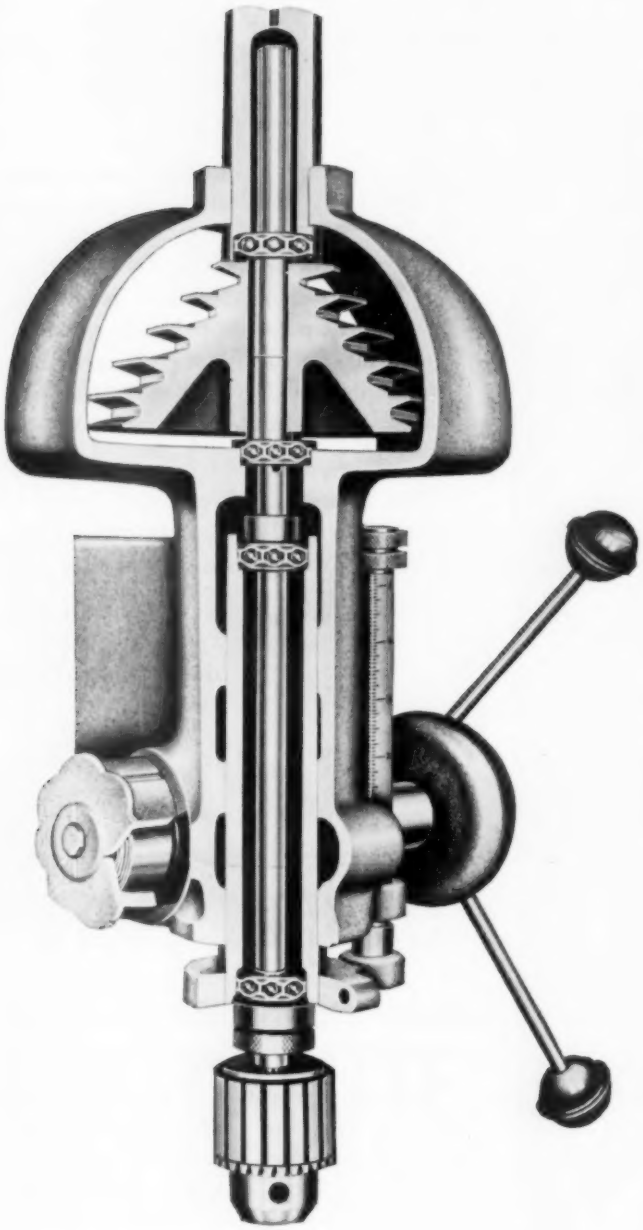
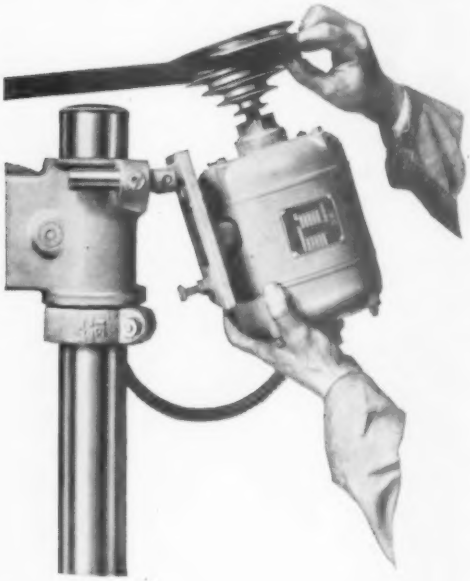
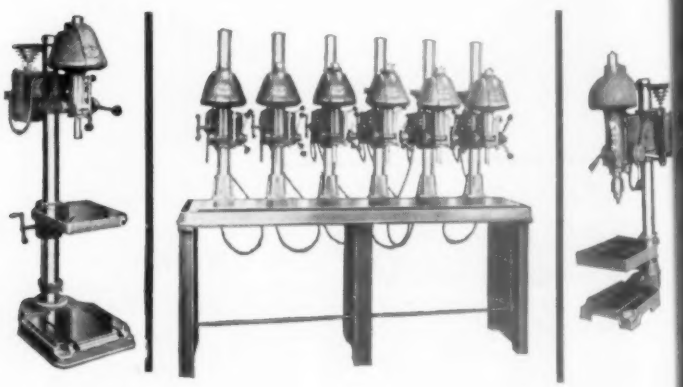


top quality

Top-quality head construction with full floating spindle drive and four sealed-for-life ball bearings —plus C-O Cincinnati's exclusive hinged motor bracket that makes belt-shifting a snap—are two of many practical features that make 16" and 18" Royal bench and floor drills "of outstanding value."



These precision drilling units, backed by a nationally recognized builder of fine machine tools, give you more quality features at economy prices. Prove it yourself. Run a Royal for half a minute and you'll get the feel of quality construction: smooth operation, and fast work. Shipped from dealer stocks near you. Write for Catalogs D-100 and D-101, and the name of your nearest representative.



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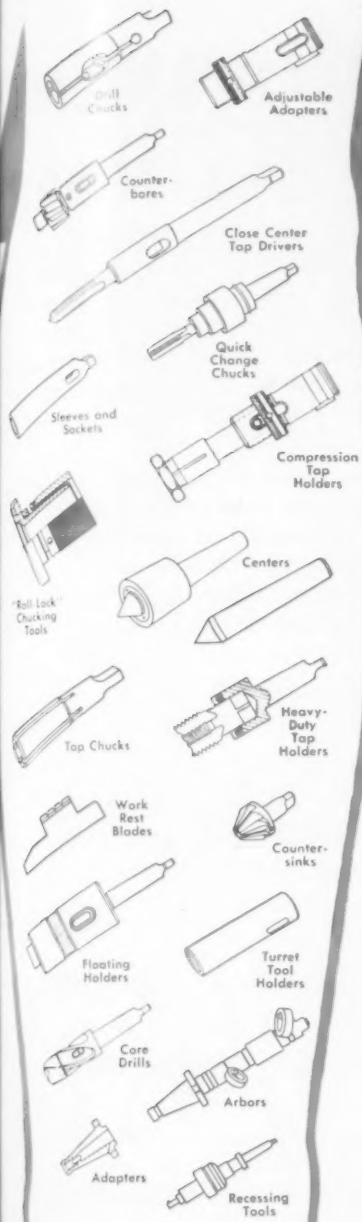


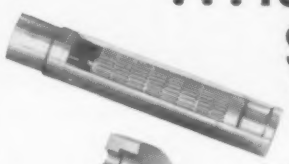
THE NEW CHUCKING TOOLS

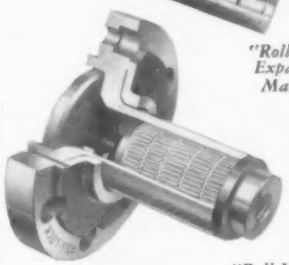
POWERFUL AND ACCURATE

. . . for precision work

SCULLY-JONES

"ROLL-LOCK"* CHUCKING TOOLS

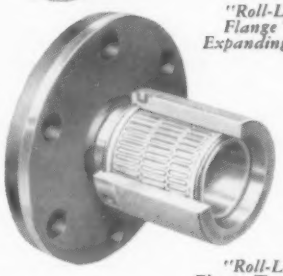




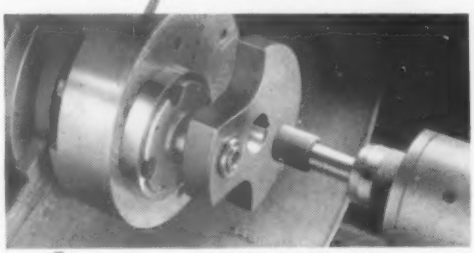
"Roll-Lock" Expanding Mandrel

"Roll-Lock" Mandrels, Arbors and Chucks use a new chucking method for holding work or tools. This method takes advantage of the elastic properties of metal.

When a very little turning force is applied to actuating ring or cone, the powerful wedging action of rollers expands or compresses the chucking surface to a shrink fit. This permits maximum torque and thrust to be transmitted, assuring accuracy often less than .0001". "Roll-Lock" Chucking Tools are engaged or disengaged quickly and easily. Yet the shrink fit cannot be loosened by reversing the rotation of the tools or by shock and vibration.



"Roll-Lock" Flange Type Expanding Arbor



"Roll-Lock" Flange Type Chuck

Shown to the right are two of the many applications in turning, grinding or inspection operations. "Roll-Lock" Flange Type Expanding Arbor and Tool Chuck being used in a finish grinding machine for holding the work and grinding tool.

**"Roll-Lock" is a trade mark of Scully-Jones and Company.*

WRITE FOR BULLETIN No. 17-50 giving detailed description and technical data on these and other "Roll-Lock" Chucking Tools.

Scully-Jones AND COMPANY

1915 S. Rockwell St., Chicago 8, Ill.

R-5828

YOU GET LOW COST FAST ACCURATE PRODUCTION WITH OUR STANDARD AND SPECIAL TOOLS

the "ARMS and HANDS" for your MACHINE TOOLS

If you think of a Lathe, Mill, Multi-Spindle Machine, or other Machine Tools as being a human body, supplying power to the parts of the body doing the actual work, then Scully-Jones tools represent the "Arms and Hands"

YOUR PROBLEMS ARE OUR PROBLEMS

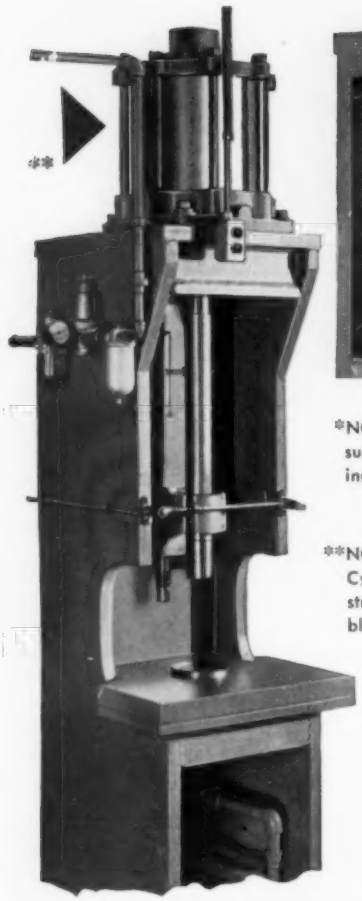
Helping you solve your tooling and production problems is Scully-Jones first objective. Ever since 1912 we have designed, developed and manufactured tools to the highest standards to help you get fast, accurate production at low cost.

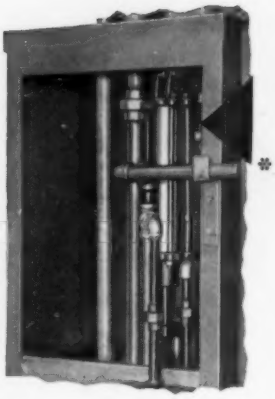
That is why you can purchase S-J Tools and get the best that engineering research, modern equipment, correct materials and expert workmanship can produce.

Use these S-J "Arms and Hands" to equip your machine tools. They will help you get low cost, fast, accurate production on such operations as drilling, reaming, tapping, milling, counterboring, countersinking, core drilling, recessing or undercutting, boring and grinding.

For current information on S-J Tools, refer to Catalog 600. Write on your company letterhead for your copy.

Let us help you solve your tooling and production problems. Because our manufacturing facilities have been expanded, we're in a position to give you reasonable deliveries. For quick service see our nearest representative or contact Scully-Jones direct.





*NOPAK Model "E" Cylinder supplies clamping or holding power for work-piece.

**NOPAK Model "D" 12"x8" Cylinder provides power stroke for "squeeze assembly" operation.

PRESS MOVEMENTS
Powered by
NOPAK CYLINDERS

Throughout industry, a variety of vital press movements are powered by NOPAK Cylinders, both air and hydraulic. For example, you'll find them on arbor presses, kick presses, punch presses, drill presses, baling presses, assembling presses, forming presses, power shears, power brakes, clamping devices, and similar equipment. NOPAK Valves control the cylinder movement.

If you build presses, there is probably a NOPAK Cylinder that's *just right* for your needs. Perhaps there are mechanically or manually operated presses in your plant which could be powered by air or hydraulic NOPAK Cylinders, and controlled by NOPAK Valves, to save valuable time, eliminate needless manual effort, speed up production.

GALLAND-HENNING MFG. CO.
2750 SOUTH 31ST STREET • MILWAUKEE 46, WISCONSIN

Representatives in Principal Cities

•

Refer to Sweet's File for Product Designers or write for Bulletin SW-1

NOPAK
VALVES AND CYLINDERS
DESIGNED for AIR and HYDRAULIC SERVICE

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-4-186-1 A 7019-½-H

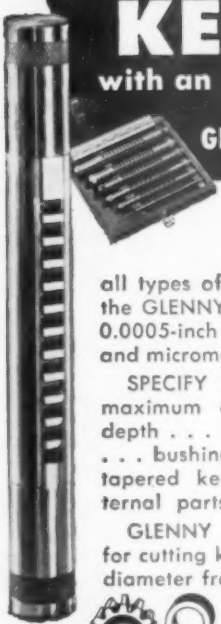
XPEDITORS
GUARANTEED TO SAVE YOU TIME
★ on clean up job
★ production
★ in semi-automatic machines

The XPEDITOR is the latest development in portable, high speed abrasive belt grinders. Instantly adjustable to any angle to give operators full view and control . . . swivels 360°. Equipped to do line contact, free belt and precision platen grinding and contour polishing. Speeds deburring and clean-up jobs; also used with jigs or fixtures or automatic feeding as a production unit . . . guaranteed to increase productivity. XPEDITOR (less motor) $59.50. Write

HESTON & ANDERSON KIRKWOOD STREET FAIRFIELD, IOWA

USE READER SERVICE CARD; INDICATE A-4-186-2

PRECISION KEYWAYS
with an *ADJUSTABLE* GLENNY PUSH BROACH



Production or short-run keyway cutting can be accomplished in all types of bushings, sleeves, gears, etc., with the GLENNY adjustable push broach. Featuring 0.0005-inch accuracy, it can be instantly adjusted and micrometer checked for precision operations.

SPECIFY GLENNY . . . greater strength . . . maximum accuracy . . . fully adjustable for depth . . . interchangeable high-speed blades . . . bushing adapters available . . . will cut tapered keyways . . . hardened tool-steel external parts . . .

GLENNY broach sets are available for cutting keyways in bores ranging in diameter from ¼ to 2½ inches.

181 KM

KASE MACHINE COMPANY
18542 Buffalo Avenue
Cleveland 19, Ohio

KASE MACHINE COMPANY
Please send (without obligation) your new Bulletin No. 13 containing sizes, specifications and prices of GLENNY broaches and kits.

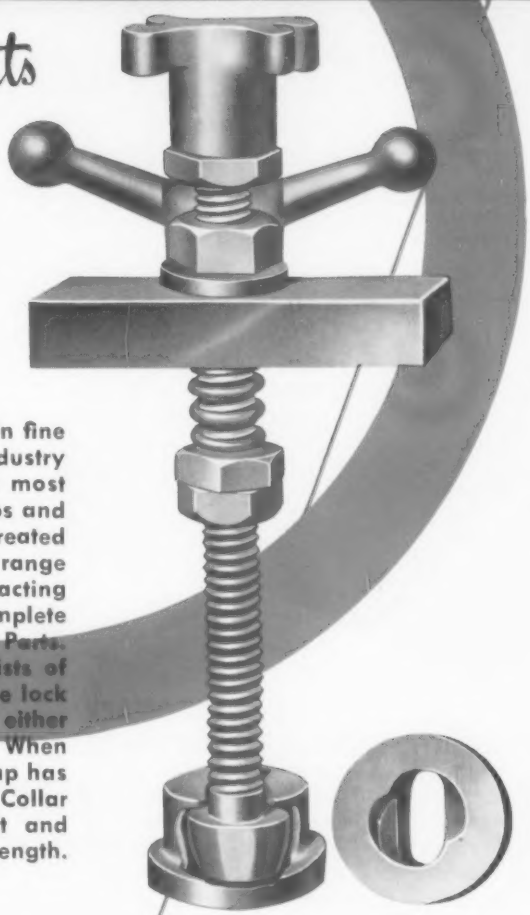
NAME _____
COMPANY _____ TITLE _____
STREET _____
CITY _____ ZONE _____ STATE _____

USE READER SERVICE CARD; INDICATE A-4-186-3

Morton

FIXTURE CLAMPS . .

and Components



QUALITY *and* SERVICE . . .

MORTON with over 30 years experience in fine tool making is recognized throughout the industry for the development and manufacture of the most economical and highest quality Fixture Clamps and Fixture Details. All precision made of heat treated selected steel, cadmium plated and in a wide range of sizes and types to fit the most rigid and exacting requirements. Standardize with MORTON—Complete Clamp Assemblies or any of their Component Parts.

The Clamp Assembly, shown here, consists of heat treated bottom insert, alloy tee bolt, three lock nuts, hand knob, spring, clamp strap and either spherical collar nut or spherical ball handle. When ordering, specify which is required. Clamp strap has spherical seat which fits either of the nuts. Collar nuts, spherical ball handle, strap, tee bolt and bottom insert are treated for maximum strength. Finished in mid-nite black.

Removable Clamp Assembly

Clamping is done by the alloy tee bolt placed through the insert which is pressed into the bottom of the pilot plate. Hand Knob provides a convenient adjustable handle for removing clamp by twisting a quarter turn to the left. A spherical collar nut or spherical steel ball handle is used to tighten clamp strap. Adjustable nuts and spring prevents strap from dropping down during removal.

Any MORTON product can be adapted to whatever changes you might specify.

Write Today!

● LARGEST ASSORTMENT OF CLAMPS IN THE INDUSTRY . . .

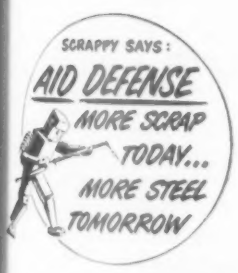
MORTON MACHINE WORKS

2421 WOLCOTT STREET
DETROIT 20, MICHIGAN

For our 72-page illustrated catalog showing our complete line. Includes full size templates for tracing purposes. SAVE tool and designing costs.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-4-187

Grandpa Never Threw a Thing Away



It's only human to want to hold on to things after they've outlived their usefulness. That's why today millions of tons of worn-out and obsolete equipment and machinery are lying forgotten in the country's plants and factories and on farms.

The steel industry needs these millions of tons of dormant scrap, needs it in the worst way. With this vital dormant scrap the entire steel supply picture would brighten up, with more steel for everybody. But without it, the steel industry cannot hope to keep up production at present levels.

Call in a scrap dealer now, today. He will buy your dormant scrap and start it moving toward the steel mills.

BETHLEHEM STEEL

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

More Scrap Today... More Steel Tomorrow

Boley No. 4 PRECISION LATHES

Three Types for Production or Tool Room

R SMALL RUNS

4E Lathe has headstock with hand wheel collet attachment, crank-type tailstock and cross slide.

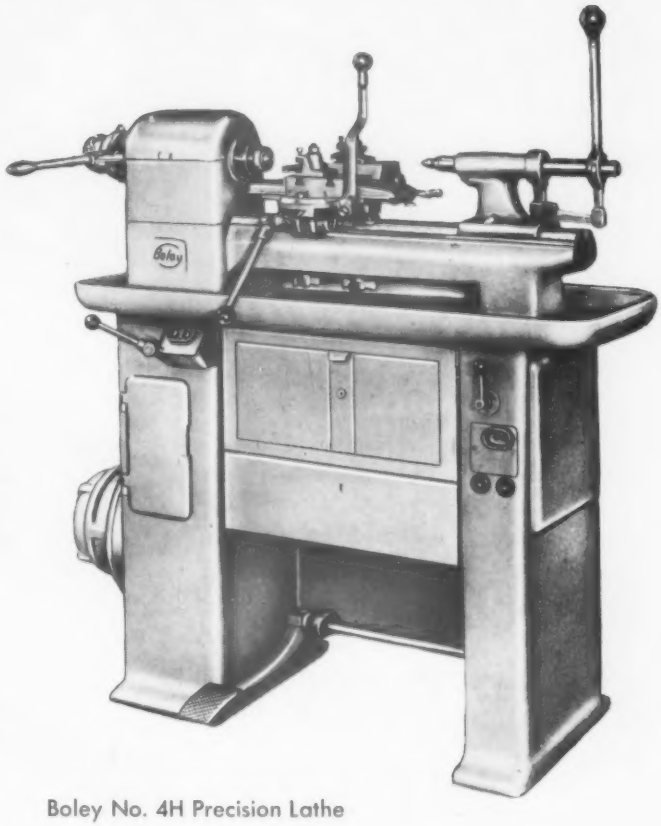
R PRODUCTION RUNS

4H Lathe has headstock with lever operated collet attachment, tailstock and cross slide.

4PS Short Bed Lathe has headstock with lever operated collet attachment and cross slide.

ECIFICATIONS

Swing—10", Distance between centers for 4E and 4H—18", Collet capacity—¾", Spindle speeds—6, 9, 12, 18 up to 3750 rpm. Powered by flange type motor with 2 or 3 speeds to three step pulley in headstock — Slides and tailstocks are interchangeable on all models.



Boley No. 4H Precision Lathe

Built to maintain toolroom accuracy on the production line, Boley No. 4 PRECISION LATHES have spindle speeds up to 3750 rpm. They are versatile, easy to operate, have multiple tool holders for cross slide and tailstock, adjustable stops to limit tool travel, lever for rapid chucking of workpiece while machine is running and rapid stopping of work spindle.

SEE THESE MACHINES IN OPERATION AT COSA'S NEW YORK SHOW ROOM OR SEND FOR DESCRIPTIVE LITERATURE.

OTHER BOLEY PRECISION MACHINE TOOLS

1, 2, 3 Precision Lathes—4", 5" or 7" swing. Maximum spindle speeds from 3750 to 6,000 rpm.

4-L Lead Screw Lathe—for cutting 4 to 80 threads per inch and precision turning. 10" swing. 12 or 18 spindle speeds up to 1900 rpm.

DW-4 Super Precision Lathe—for microfinish machining with diamond or carbide tools. 10" swing. 3 spindle speeds up to 3000 rpm.

REV Turret Lathe—for intricate turning and thread cutting. 1" or 1-5/8" bar capacity. 6 to 8 turret tool holders. Spindle speeds from 300 to 2500 rpm.

Multiple Spindle Drilling and Tapping Machines—10 or 13 spindle speeds from 560 to 3000 rpm. Drilling capacity in steel up to 5/16".

COSA CORPORATION
405 Lexington Ave., New York 17

Your source for all Precision Machine Tools—from Small Bench Lathes to Large Boring Mills

IN DETROIT AREA contact DETROIT-COSA CORPORATION, 16923 James Couzens Highway, Detroit 35, Mich.

Van Keuren

LARGE AND SMALL MEASURING WIRES

BIG ONES LITTLE ONES ANY SIZE AT ALL

PERFECT cylinders for all measuring purposes,—Threads, Gears, splines, dovetails and angles.

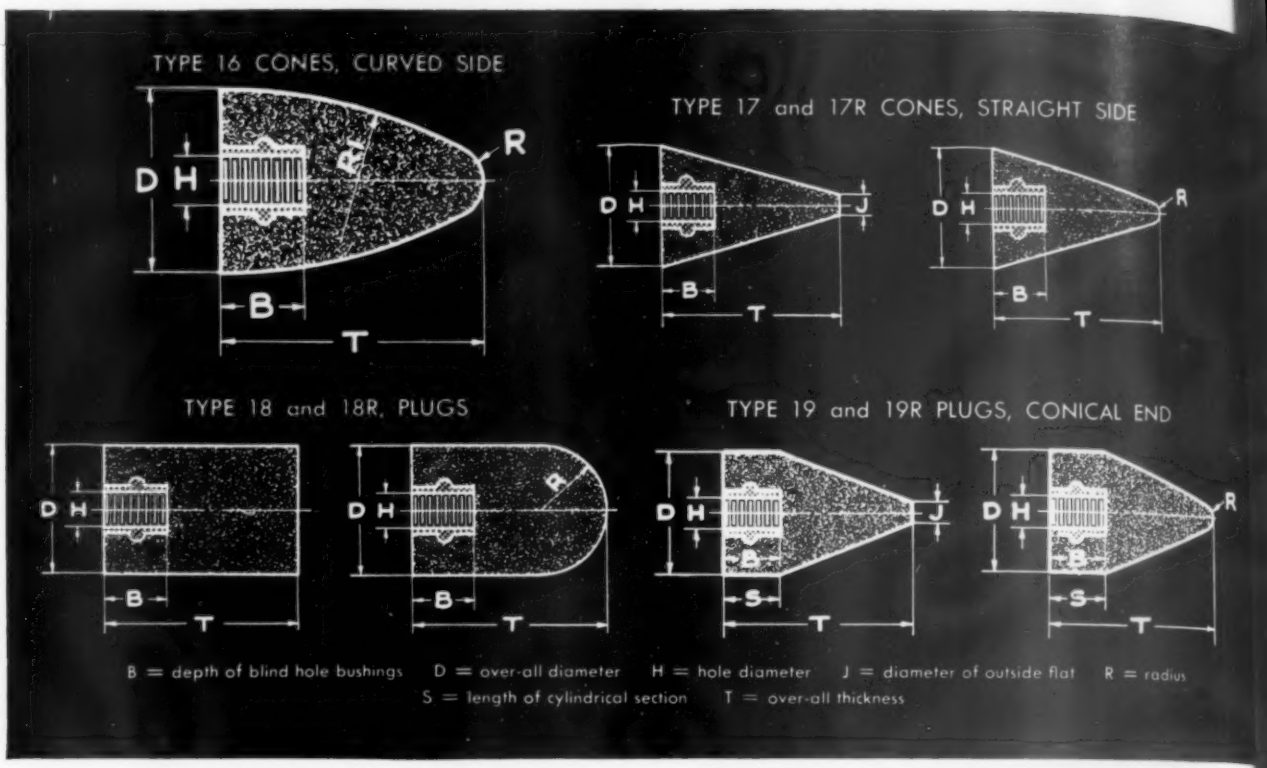
Complete specifications on Van Keuren Measuring Wires, and formulas for their use are given in the Van Keuren 1952 Catalog and Handbook No. 35.

Write for your copy

THE Van Keuren CO.,
173 WALTHAM STREET, WATERTOWN, MASS.

33rd YEAR

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Cemented Carbide Plug Gages • Carboloy Cemented Carbide Measuring Wires



WHAT ARE STANDARD GRINDING WHEELS? They are the sizes and shapes selected by the National Bureau of Standards on the basis of: (1) widest use by industry; (2) widest range of adaptability to modern grinding equipment; and (3) most commonly carried in manufacturers' and distributors' stocks.

Specifically, in cones and plugs alone, there are 86 different "standards" in the seven types shown above. For your convenience, they are listed in easy-to-read charts in "Standard Shapes and Sizes of Grinding Wheels" issued with the permission of the National Bureau of Standards.

You benefit 3 ways from standard grinding wheels

When you specify, order or use standard sizes and shapes of all grinding wheels you save time, money, and trouble.

1. Grinding wheel manufacturers naturally make more "standards" than "specials" . . . are more likely to have "standards" in stock. So, your chances of getting what you need when you want it are best when you hold to "standards."

2. When you stay with "standards," instead of spreading into "specials," you cut down on the number and variety of wheels you have to stock. You tie up less money in inventories. That's good business.

3. You also get the advantage of carefully engineered strength at *all* vital parts, a safety factor which is designed in *every* standard grinding wheel.

Add up these three benefits and you'll agree that standard grinding wheels are your best buys.

MAKE SURE THAT YOU ORDER "STANDARDS" by checking your wheels against the simple standard charts in the bulletin "Standard Shapes and Sizes of Grinding Wheels" before you buy. If you already have a copy, consult it regularly. If you haven't, check the coupon below and mail it today.

GRINDING WHEEL INSTITUTE, 2130 Keith Bldg., Cleveland 15, Ohio

Please send me:

Standard Shapes and Sizes of Grinding Wheels.

Also the following checked booklets to help me improve my use of grinding wheels:

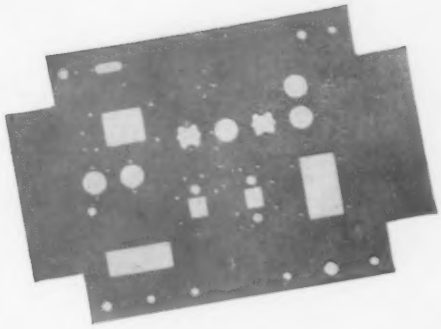
☐ Safe Speeds for Grinding Wheels ☐ Safe Rules for Disc Grinding ☐ Mounting Techniques for Wheel Sleeves on Cylindrical Grinding Machines ☐ Safe Operation of Portable Grinding Machines ☐ Safe Rules for Handling, Storing and Inspecting Grinding Wheels ☐ Maintenance Recommendations of Heavy Speed, Heavy Duty Swing Frame and Floor Stand Grinding Machines ☐ Standard Specifications of Segments Used in Chucks ☐ Safety Code: The Use, Care and Protection of Abrasive Wheels

Name ..... *Title* .....

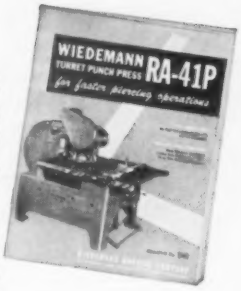
Address .....

City ..... *Zone* ..... *State* .....

If you produce...



SEE WIEDEMANN



Bulletin 241 describes the most efficient method of producing chassis and similar work in short runs and semi-production runs. Repeat runs of 5 to 1,500 pieces and single runs of 50 to 5,000 pieces are economically produced on the Wiedemann RA-41P. Write today for bulletin 241.

THE WIEDEMANN METHOD permits you to: (1) Keep up with engineering changes without materially affecting production schedule; (2) Keep tool inventory low; (3) Produce quantities in accordance with sales requirements; (4) Produce accurate work with inexpensive tools.

"THE WIEDEMANN METHOD" through the elimination of expensive punch and die set-up and work location methods, provides an efficient means of piercing single pieces, and semi-production runs, regardless of repeat frequency.

Machines available for piercing sheet and plate up to ½" thick, up to 120" wide x 200" long.

Wiedemann
TURRET PUNCH PRESSES

WIEDEMANN MACHINE COMPANY

4245 WISSAHICKON AVE., PHILADELPHIA 32, PENNSYLVANIA

FOR FURTHER INFORMATION, USE READER SERVICE CARD: INDICATE A-4-195

CMD LUBRICANTS

PAY OFF in higher production

...Because they have better anti-scoring qualities to work under extreme pressures.

Use CMD on your lathe centers, die set leader pins, steady rests, machine ways, cams, broaches, thrust bearings, taps and dies to name a few. In fact, CMD lubricants work every day under pressures of 40,000 to 50,000 pounds per square inch in thousands of plants from coast to coast.

CHICAGO MANUFACTURING & DISTRIBUTING CO.
1908 West 46th Street • Chicago 9, Illinois

Attach this coupon to your letterhead for FREE SAMPLE KIT Number **54**

Your Name_____

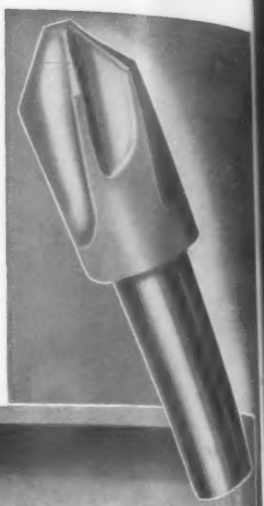
Firm Name_____

Address_____

USE READER SERVICE CARD; INDICATE A-4-196-1

GROBET CHATTERLESS COUNTERSINKS

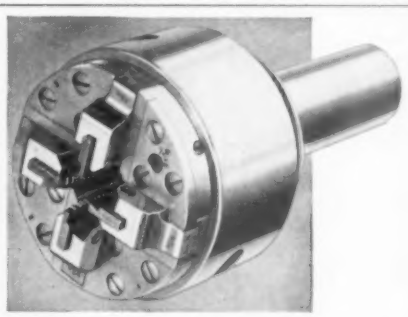
They are terrifically popular because the six staggered cutting edges are scientifically designed to give a shearing cut and thus eliminate all chatter.
Made in 12 sizes in all degrees; also supplied as sets in strong Kit-cases.



Send for Catalog Sheet HC1

GROBET FILE CO. of AMERICA, INC.
421 CANAL STREET, NEW YORK 13, N. Y.
PLANTS: NEW YORK, CHICAGO, MONTREAL

USE READER SERVICE CARD; INDICATE A-4-196-2



An IDLE man at a BUSY automatic spells profits »» a BUSY man at an IDLE machine spells LOSS

H & G INSERT CHASER DIE HEADS ARE PREFERRED BY SCREW MACHINE ENGINEERS BECAUSE THEY SPELL . . . LESS DOWNTIME . . . BETTER THREADS . . . LOWER COSTS

THE EASTERN MACHINE SCREW CORPORATION
27-47 Barclay Street, New Haven, Conn.

H&G Insert Chaser DIE HEADS

Write for informative literature

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-4-196-3

REPLACE CARBIDE TOOL TIPS QUICKLY AT LOW COST

NEW TIP-BRAZING UNIT IDEAL FOR METAL WORKING SHOPS

Now — a safe, easy, economical way to braze carbide tool tips on tool shanks. This new tip-brazing unit is a low-cost investment for any shop and will soon pay for itself. Many already in use with proven successful results.

REQUIRES MINIMUM TIME

Tips are removed and replaced on 1½" by 1" tools in as little as 2½ minutes over-all. All elements are adjustable.

ECONOMICAL TO OPERATE

Uses 75 lbs. compressed air in combination with manufactured or natural gas at regular city pressure. No expensive electrical controls required. No complicated equipment to service or maintain.

GREATER ACCURACY

Refractory-cup radiant gas burners, supported by adjustable clamps, can be faced to within ¼ to ½ inch of tool shank.

SAFE, FOOLPROOF METHOD

No "blasting" over the tool because velocity of burning gases is largely dissipated within burner cup. No danger of flux being blown off at tool end before brazing is completed. Less inclination toward oxidation than other methods.

ATTRACTIVE — RUGGED — COMPACT

Modern, streamlined appearance. Requires only five feet of floor space. Sturdy construction to provide long, constant use.

EASY TO OPERATE

Few moving parts and simple operation make it easy for any workman to do the job without special training. Tool tips are easy to get at.

VERSATILE

Unit also ideal for annealing welding tools and heat treatment of small parts. A small oven can easily be adapted to the unit. Higher temperature bronze bond can be used rather than silver solder.

SEND TODAY FOR FREE CATALOG

VALLEY MACHINERY & SUPPLY CO.
P. O. Box 434, Rock Island, Illinois

Please send illustrated catalog on New Tip-Brazing Unit.

Name _____

Address _____

City _____ State _____

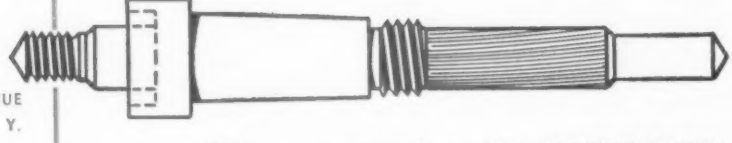
VALLEY MACHINERY & SUPPLY CO.
P. O. Box 434 Rock Island, Illinois

PETERMANN

AUTOMATICS

for close tolerances . . .

Typical part (shown full size) produced on a Petermann Automatic.



This newest member of the PETERMANN family offers new and valuable features such as six radial tools (all independently controlled), hydraulic buffer for shortening the time of return stroke, an accelerator which speeds up the cam shaft during "idle time," an automatic lubricating system and a speed box change for both spindle and cam shaft.

Complete service and parts in America.

RUSSELL, HOLBROOK & HENDERSON, INC.

292 MADISON AVENUE
NEW YORK 17, N. Y.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-4-199

Index of The Tool Engineer Advertisers

April, 1952

The Index to Advertisers is published as a reader service. Although every precaution is taken to assure correct listings, no allowance can be made for error or omission.

*Exhibitor in 1952 ASTE Industrial Exposition

♦User of ASTE Data Sheets

THE TOOL ENGINEER REGIONAL ADVERTISING OFFICES

EASTERN
Austin G. Cragg
400 Madison Ave.
Phone: Plaza 9-4018
New York 17, New York

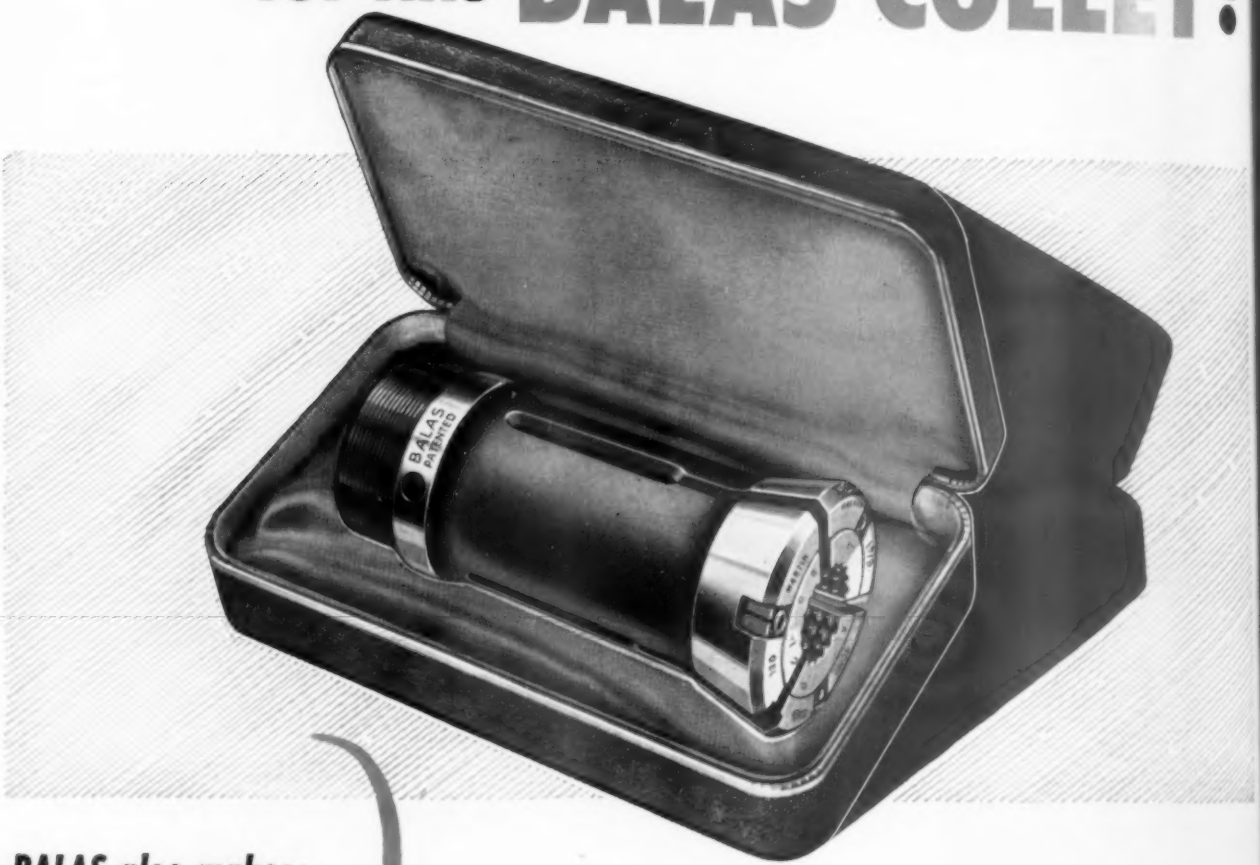
OHIO
Richard E. Cleary
Commercial Bank Building
Phone: Berea 4-7719
Berea, Ohio

CENTRAL
Clarence T. Etter
10700 Puritan Avenue
Phone: University 4-7300
Detroit 21, Michigan

WESTERN
Stanley F. Girard
540 N. Michigan Ave.
Phone: Michigan 2-4465
Chicago 11, Illinois

PACIFIC COAST
W. R. McIntyre
423 First Trust Bldg.
Phone: Ryan 1-6981
Pasadena 1, California

would you pay $1000 for this BALAS COLLET?



BALAS also makes:

- Solid Collets
- Special Collets
- Master Collets
- Squirrel Cage Pushers
- Master Pushers
- Feed Fingers

This collet costs only a small amount of money and is a relatively inexpensive part of your production equipment. Yet the quality and rate of your production is vitally dependent upon it.

If your machines cannot operate at top efficiency... if your scrap losses are mounting... the installation of just one Balas Collet might easily be worth $1000 to you in profits!

Balas Collets are machined to exact tolerances from selected steels, properly heat treated and rigidly inspected to insure greater accuracy and longer life. In addition, all Balas Collets are cam-ground on the taper to a special "Cloverleaf" shape. This permits faster opening and closing, prevents "sticking" of the chuck and reduces chatter.

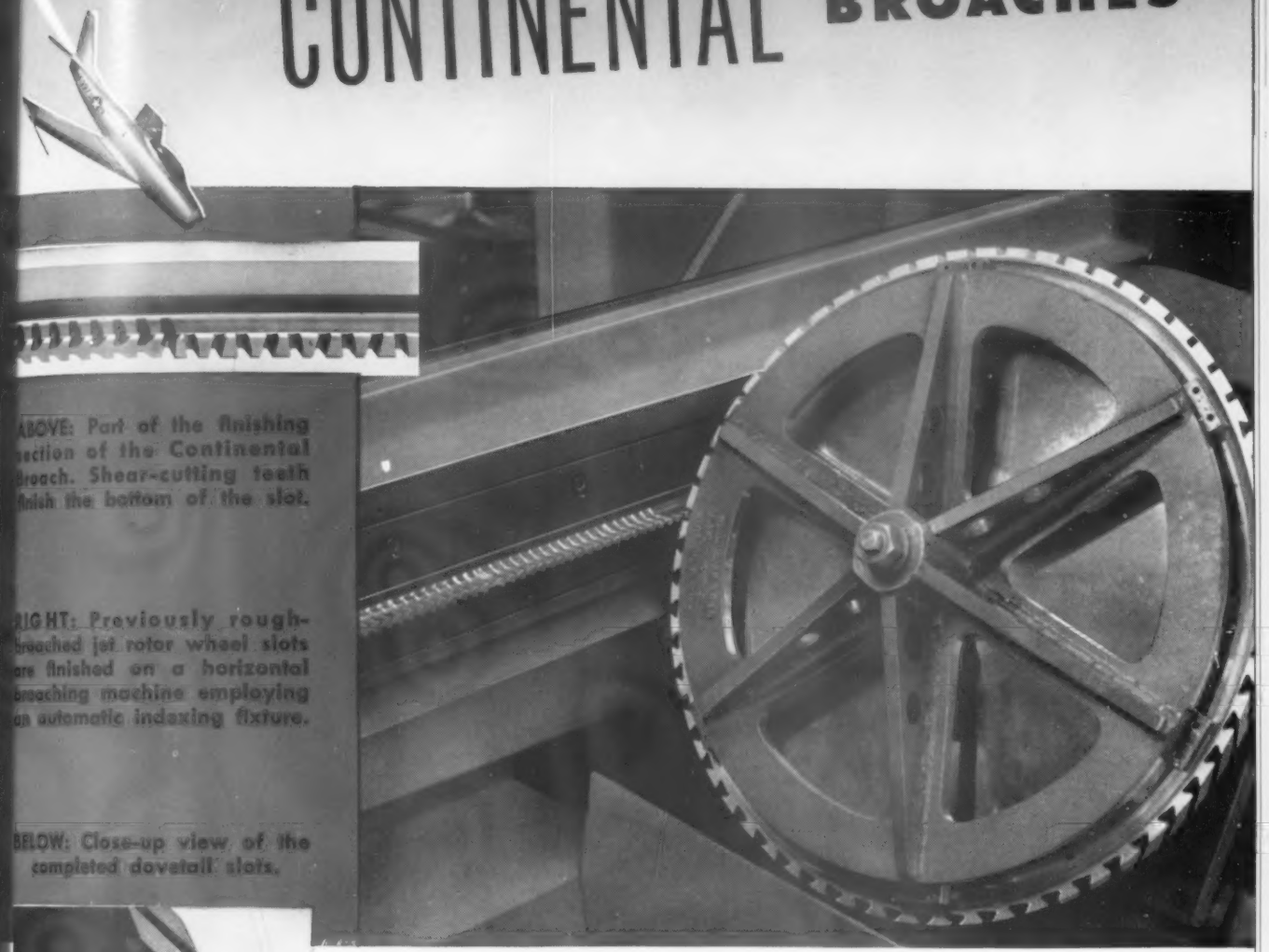
You can produce better work and get longer runs with Balas Collets yet they cost no more than ordinary ones. Ask for them by name.

BALAS COLLET MANUFACTURING CO.

1560 EAST 27th STREET CLEVELAND 14, OHIO

WORLD'S LARGEST MANUFACTURER OF COLLETS EXCLUSIVELY

JET ROTOR WHEELS SLOTTED BY CONTINENTAL BROACHES



ABOVE: Part of the finishing section of the Continental broach. Shear-cutting teeth finish the bottom of the slot.

RIGHT: Previously rough-broached jet rotor wheel slots are finished on a horizontal broaching machine employing an automatic indexing fixture.

BELOW: Close-up view of the completed dovetail slots.

CONTINENTAL BROACHES TAKE HEAVY CUTS TO MINIMIZE WORK HARDENING

The heat-resistant stainless steels used in jet aircraft engines present a special machining problem because of their toughness and work-hardening tendencies. The solution is a rigid setup, ample power and properly-designed tools.

Shown here is a typical application of a Continental Broach cutting accurate, uniform dovetail slots in a jet rotor wheel. The broach is designed to take substantial cuts to minimize work hardening. These slots are cut in two operations, although some shops prefer to complete each slot in a single pass.

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